S - 387 Total No. of Pages : 7

T.E. (Mechanical) (Semester - V) (Revised) Examination, May - 2015 CONTROL ENGINEERING Sub. Code : 48769

н.

Day and Date : Teurshay, 28 - 05 - 2015 Time : 2.30 p.m. to 05.30 p.m.

Serie Nati

Tutul Marks : 109

- Instruction (1) Question No 1 and 5 see compilatory. Solve any two questions from remaining in Each section
 - 2) Assume suitable data wherever accessary and state it clearly
 - 2) Figures to the right indicate full marks
 - 4) Draw neal electrics wherever necessary

SECTION - 1

- (21) (i) Draw the block diagram of a speed control of steam engine system indicating the function of each element. [6]
 - b) Show that the two systems shown in Fig 1(b) are analogous systems, by comparing their transfer (methons, [6])

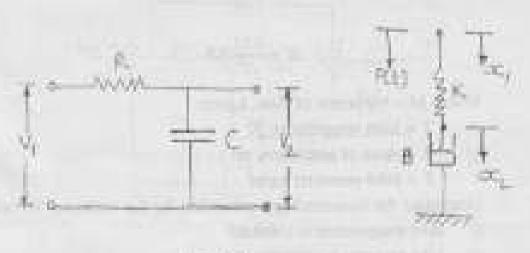


Fig. 1 (b)

P.T.O.

Consider Rotational system shown in Fig 1(c) 63.

J = Moment of inertia of diale where. B - Pricting constant K = Torsional spring constant

and disk subjected to imque TOS-

Draw its analogous network based on (ii) F-l analogy

(i) E-V analogy

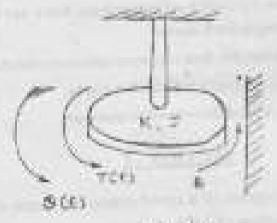


fig - l(c)

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161

- Derive the differential equation which relates input and nutput metion (024.0) $\{8\}$ of hydralic servemeter, for steady state operation.
 - For some flow of air through a fixed restriction, the mass rate of ficw is bb183

$$M = \frac{0.53}{\sqrt{7}}AP$$

Where M = Mass rule of flow, kp/io;

T = Inlet temperature, K

A = Area of restriction, m¹

P = Iniet pressure, kg/m*

Determine the linearized approximation for the variation 'm' when Inlet temperature is constant

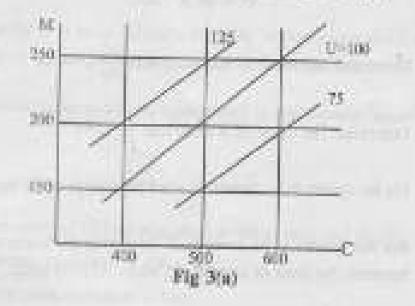
131 Inlet pressure is constant

ΒY.

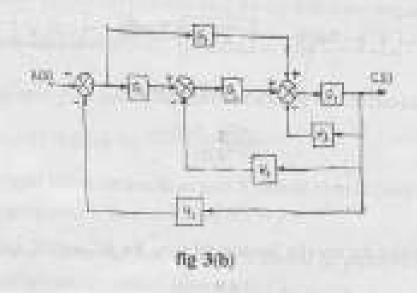
(iii) Both inlet temperature and pressure constant

The stendy - state operating curves for a system to be controlled are above to Fig.3(a). The reference operating condition is $V_{i}=C_{i}=500$, $U_{i}=100$ and M=200. Determine the slope of the controller lines such that the controlled variable does not decrease by more than 4 percent of its reference value ($C = 0.04\times500=20$) when U = 125, [8]

(231n)



 Reduce the given block diagram shown in Fig 3(b) and then obtain the transfer function of the system if G₁=G₂=1, G₂=G₂=2 and H₂=H₂=1, H₁=2



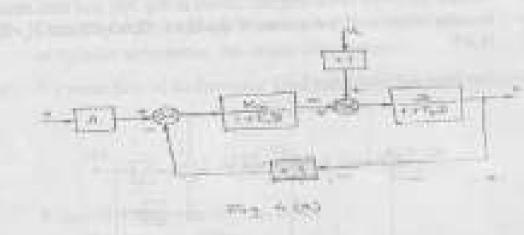
8 - 387

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The block diagram of a feedback control system for operation about a reference operating point is shown in Fig 4(n). The steady state equation of operation in [8]

$$C = \frac{\partial C}{\partial V} \left[v + \frac{\partial C}{\partial V} \right]^{-1}$$

- (i) Determine the value of KG such that $\frac{\partial C}{\partial U} = 0.00$
- ii) Determing the value of A noch that $\frac{\partial C}{\partial V} I_0 = 1$.
- 10.1 For the system to be controlled, what is the slope of the least of constant U.1.
- iv) For the system to be controlled, determine the horizontal spacing ∆C between the lines of constant U when ∆U=10 units



(c) Derive the transfer function relations for AC and DC tachometers. [8]

SECTION - II

(25) a) The loop transfer function of a unit feedback control system is,

$$G(x) = \frac{K}{S^2 + 3S^2 + 3S - 7}$$

Draw the root learns diagram, mark the solican points and determine the tringe of K for a closed loop system to be stable. [9]

b) A monul order system is represented by the muster function. [9]

$$\frac{Q(s)}{I(s)} = \frac{1}{3r^2 + j_0 + K}$$

A step upon of 10 NM is applied to the system and the test results are

- Maximum overshort = 6%
- Time at prak overshoot = lace.
- (ii) The steady state value of the output is 0.5 cadiants Determine the values of $J_{\rm c}$ f and K

(26) a) Obtain the transfer function G(s) for the following output and state space equations $y(t) = t_1, \frac{dt_1}{dt} = -3t_1 + t_2$ and $\frac{dt_2}{dt} = -2t_1 + u(t)$ (8)

- bi. The open loop transfer fonction of a unity FBCS(Feed Back Control
 - System) is given by $O(s) = \frac{K}{S(S^T + 1)}$ (8)
- (b) By what factor the ampliture gain X should be multiplied so that domping ratio is increased from 0.2 to 0.8
- By what factor the time constant T should be multiplied so that the damping ratio is reduced from 0.6 to 0.3.

(07) a) A conirol system having,

$$G(x) = \frac{K(S^2 - 2S + 5)}{(S + 2)(S - 0.5)}$$
 and $H(x) = 1$

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il Break away pounts

- ii) Maximum and minimum values of K for stability
- iii) Crow over trequency
- iv) Angle of arrival
- b) Determine the computer diagram and state system model for a transfer function of the system in
 [8]

$$\frac{F(S)}{R(S)} = \frac{2S+9}{S^3+8S^2+12S+10}$$

use direct programming method

(28) a) A unity feedback system has $G(s) = \frac{K(s+13)}{\sigma(s+3)(s+7)}$. Using Routh's Criterion calculate the range of K for which the system is

i) Stable

ii) has its closed loop poles more negative than +1 (8)

b) Determine the state space model and computer diagram for feedback control system shown in Fig 8(b) [8].

n+2 - 生活 网络 71-1-12 2438+4 Fig 8(b) *** $\sim 7 \gamma$

S - 387

Scat. No. S = 383 Total No. of Pages 13

T.E. (Mech.) (Part - III) (Semister - V) Examination, May - 2015 HEAT AND MASS TRANSFER Sub, Code : 45550

Station Station 1965

Day and Date : Thursday, 21 - 05 - 2015 Time : 02.30 p.m. to 05.30 p.m. Total Marks; 100

Instructions: 1) Solve any three questions from Section -1 & Section - II each.

2) Assume suitable data if precessary and montion it clearly.

3) Figures to the right indicate full marks.

SECTION - 1

(21) a) Derive the expression for critical radius of insulation for cylinder. [6]

b) Thermal conductivity of plane wall varies with temperature according to tellation k(T) = k₁(1 + β T²) where k₁ and β are constants. Develop at expression for beat flow through slab per unit area if surface at x = 6 and x = 1, are maintained at uniform temperatures T₁ and T₂ respectively. Hence calculate the heat transfer rate through A = 0.1m², T₁ = 200°c.

$$T_2 = 0^{\alpha}C_1 L = 0.4m_1 k_1 - 60^{\alpha} M_{m}^{\alpha}C^{\alpha}, \beta = 0.25 \times \{0^{-\alpha} \circ C^{\alpha}, \dots, \{10\}\}$$

- Q22 a) Write the general heat conduction equation in cylindrical coordinates and hence derive the relation for temperature distribution in long hollowcylinder with heat generation rate (Q9) with inside outside temperatures as T and T, respectively Take r, and r, as inside and outside radii [8].
 - b) A pin fin of 2.5 cm dinneter is provided on surface exposed to air at 27°C. After a steady state the temperatures at two points 7.6 cm apart were found to be 126° C and 91°C respectively. The heat transfer

coefficient over the surface of fin is 22.7 $\frac{w}{m^2k}$. Weat is the thormal conductivity of fin material? [8]

P.T.O.

- Q2) a) A thermocouple junction in in the form of Same sphere. Properties of material are c₁ = 410 ¹/_{kgK}, p = 8005 ^{kg/}/m², k = 40 ¹⁰/_{out} and b = 45 ¹⁰/_m²k. Junction is initially at temperature of 28°C and interted in last at some statement is 300°C for 10 seconds. It is taken out after 10 seconds and hept in still air at 30°C wath n = 10 ¹⁰/_{outk}. Find the temperature statement by the junction 15 seconds after removing from hes air atenus. [10]
 b) Discuss Planck's law for spectral distribution. [8]
 - $Q_{ij}(0)$

The temperature of black body of area 0,1m² is 900k. Chiculate the total

rate of energy emission, intensity of normal radiation in $\binom{10^2}{2m^2 sr}$ maximum monochromatic emissive power and wavelangth at which it occures. Given : $C_1 = 1.287 \times 10^{-3}$

b) The not radiation from the surface of two parallel plates maintained at temperature T₁ and T₂ is to be reduced by 75 times. Calculate matches of shields to be placed between two surfaces if unissivity of shield is 0.05 and that of surfaces is 0.8. [8]

SECTION - II

- Q(f) a) Crive the significance of reference temperature in convective heat transfer.
 What is mean film temperature balls mean temperature?
 - b) Liquid mercury flows through a coppor tube of 2 cm inner diameter at the rate of 1.25 kg is. The mercury enters at 15°C & is beated to 25°C as it passes through the tube. Determine the tube length which would satisfy the condition of a constant heat flux at the wall which is at an average temperature of 40°C.

For liquid metals, the following correlation is previoused to agree well with experimental results.

Nu=[7+0.025 (pe)**]

Where, 'pe' is the pectet number ($pe = (pe \times Re)$ at the mean bulk temps,

$$tb = \frac{15 + 25}{2} = 30^{\circ} C$$
,

The thermo-physical properties of the liquid mercury are, $p = 13580 \text{kg/m}^2$; K = 8.685 w/m.k; Cp = 139.351 kg k $\gamma = 1.145 \times 10^{-100} \text{s}^2/4 \text{ pr} = 0.0249$ [8]

- (26) a) Discuss the mechanism of convective heat transfer in detail. Give Newton's law of heating cooling. What is heat transfer enellicient? [8]
 - (b) A horizontal cylindrical heat exchanger of shall diameter 40cm and author temperature 124% is to be cooled by ambient air at 30%. Workout the convective coefficient and the rate of heat loss from unit surface area of the heat exchanger. Use the correlation, Na = 0.54 (Gr.Pr) 0.25. Properties of air at mean fills, temperature are;

- (07) a) Derive as expression for effective of counterflow heat exchanger. [8]
 - b) 45 kg/hr of water is to be heated from 10°C to 70°C with flue groen having an initial uniperature at 160°C. The massflow rate of the flue.

gases is 170 kg/in. The specific heat of the gas is 1.05 MARA The

overnikhent transfer coefficient may be taken as 114 w/m².k.

Calculate the heat transfer anti-required for counterflow type heat, exchanger.

Assume specific heat of water as 4.18 kj/kg/k. [8]

Q87 White short neves on (Any Three):

- a) Fick's law of diffusion
- b) Heat pipe
- c) Condensation & its types
- d) Forced convertion boiling
- c) LMTD correction factor
- f) Fouling & its types

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-3----

[18]

Total No. of Pages : 4

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Scal No.

T.E. (Mech.) (Part - III) (Semester - V) Examination, May - 2015

MACHINE DESIGN - I

Sub. Code : 45551

Day and Date | Tresday, 26 - 09 - 2015

Total Marks : 100

Time (2.30 p.m. to 5.30 p.m.

Instructions (-1) Attempt any three quastions from each section -

- 2) Figures to the right indicates followarks.
- 3) Draw slottches it required.

4) Assume suitable data & resultion the same clearly.

SECTION-1

- Q1) a) Explain in brief factors govern the selection of material for mechanical component.
 [6]
 - b) What is factor of safety? Why it is used in Machine design? [5]
 - Suggest suitable material for following components giving the reasons.

-[6]

- il Automotive cylinder black.
- ill Gentu
- iii) Flange for ovapling.

(Q2) a) Explain design procedure of Knackle joint with the help of neat sketch.
[7]

(b) Design a right angled bell crank lever having one arm 500 mm and other 200 mm long. The load of 6 EN is to be raised acting on long nm end by appling effort at short arm end. The permissible stresses for lever and pin are 80 Mps to tension and 60 Mpc in short. The bearing pressure is limited to 12N/mm². The lever to rectangular in cross spectron. Assume depth of lever is there times the thickness and the pin length is 1.25 times pin diameter. [10]

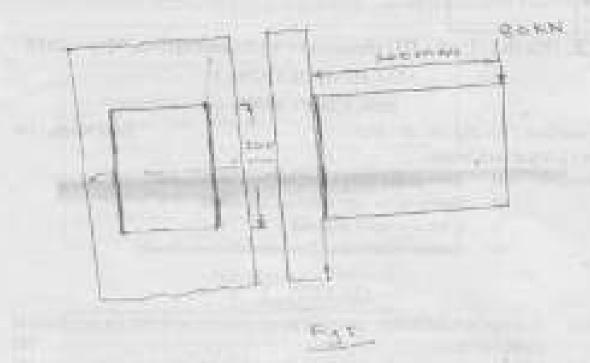
(23) a) Describe the design procedure of holts subjected to eccentric loading acting perpendicular to the axis of bolts. [7]

b) A bracket is welded to the vertical plate by means of two fillet welds as shown in figure. Determine the size of welds, if permisible shear stress is limited to 100 N/mm³. [9].

RTO.



100



- Q40 a) A mild steel shall is required to transmit 100 kW at 500 spm. The supported length of shall is 4.5 meters. If contex two pulleys each weighing 1200 N supported in a distance of 1.5 soster from the each respectively. Determine the distance of shaft if safe shear stress for shaft material is 70 N/mm².
 - (c) Explain design procedure of mult coupling with neat sketch. [6]

SECTION - II

- Q(5) is Derive equation for combined stiffness if number of springs are used in series and parallel. [6]
 - b) Design helical compression spring for maximum load of 2000 N for deflection of 20 mm. Take spring index as 5 permissible shear stress in 400 N/mm² and modules of rigidity 84 × 10^oN/mm² Refer table for wire selection. [10]

SWO	4/0	3/8	2.03	0	1.1
Wue dia	10.160	9:490	8.839	8.229	7.620
mm					

1101

(26) a) Explain self locking & overhauling preperties of power screw. [6]

b) Square threaded screw exerts load of 50 km with nominal diameter of 100 mm and pitch of 12 mm. Height of nut is 150 mm. Coefficient of friction between screw & mit is 0.15.

Find

- Force required at end of rim of 300 mm diameter.
- Maximum shear stress
- iii) Transverse shear stress
- iv) Bearing pressure
- v) Efficiency of Screw

(27) a) Espinin coefficient of fluctuation of energy in case of flywheel. [7]

- b) Two stroke petrol engine develops 15 kW @ 500 RPM. Coefficient of fluctuation of energy in 1.93 and coefficient of fluctuation of spord is 0.03. If mean diameter of flywheet rim is 500 mm and hub and upokes provides 5% of rotational inertia of wheel. Find mass and cross section of flywheel, if density of flywheel material (C.I.) 7200 kg/m². [10]
- Q8) a) Give various steps to select yee belt from manufacturer's catalogue. [7]
 - b) Select flat belt to connect two transmission shafts rotating at 1000 and 500 RPM respectively. Centre to centre distance between shaft is approximately 2.5 m. The drive is open type. The power transmitted is 25 kW.

Belt is used to drive contrilingal pump with steady lead

The belt operates at velocity range of 17.8 to 22.9 M/sec. The power transmitting capacity of belt per mm width per ply at 180° are of contact and at belt velocity of 5.08 m/sec is 0.0147 kW.

Refer data short supplied.

[10]

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The second se	CONTRACTOR OF A DATE	A DOMESTIC AND A DESCRIPTION OF A DESCRI	ALC: NAME OF TAXABLE	1 - A - A - A - A - A - A - A - A - A -
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Type of load	P.
17 Normal load	4.6
 Study fout, e.g. crimitigst pump fans light miching tools - recoverying 	1.2
iii) henemittent loof, e.g. heney duty fare - tilowere compression - recipiodating pumps - line shafts	1
hnovy duty machines (v) Shack load, e.g. gamore pamps - rolling mills hammers - gatodres	1.5

Are of contact factor $(\mathbb{F}_{\hat{e}})$

a idegreesi	128	1.90	144	130	160	170	110	190	200
1.	1.35	1.25	1.10	1.13	1.88	1:04	1.00	0.997	0.94

Standard widths of these belts (in mm)

330	35 40	50	iŭ	70			
any.	40. 04	.90	38	26	101.100	1125(125)	153
5.00	265,000	110	1223	152			
0.85	1825.125	182	(38)	200		-	

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Seat No. S - 384 Tetal No. of Pages (3

T.E. (Mechanical Engineering) (Semister - V) (Revised)

Examination, May - 2015

MANUFACTURING ENGINEERING (New)

Sub, Code : 45565

Boy and Date : Saturday, 23 - 05 - 2015

Total Marks : 109

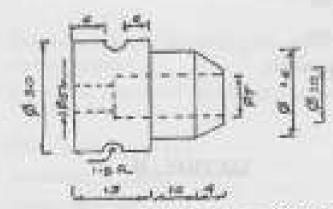
Time ; 1.30 p.m. to 5.30 p.m.

Instructions 1 Decetion No. 1 and Question No. 5 are compulsory.

- 2) Solve two questions frains remaining questions of each section.
- 3) Figures to the right indicate full marks.
- d) Assume suitable data wherever necessary and state it clearly.
- 5) Use of non-programmable calculator is allowed,

SECTION - 1

- Q1) The component shown in Fig. 1 is to be processed on a single spindle automat. Study the component and prepare [18].
 - a) Detailed process shoet
 - h) Teel Layout.
 - c) Cam profile for drilling operation
 - d) Calculate production rate per hour



All allutenariants and in mink

Fig.2

ETO.

8 - 3.84

- Differentiate clearly between orthogonal and oblique cuting operation 021 10 141 with near shouth.
 - b) Discuss in brief the methods of reducing BUE formation during metal 56 CURRENT
 - The following values relate to a cutting test under orthogonal cutting 1.13 conditions for machining of aluminam. Forces determined are $F_{\mu} = 1500 \text{ N}, F_{\nu} = 1000 \text{ N}, A = 10^{\circ}, r = \chi \sim 0.37$. Determine as per Merchant's TREORY THE CUTTING FORCES No. Fs.N and F. Also determine the co-off. At chip tool interface. 081

the second s	The second se	10.4 T
AND REAL PROPERTY.	investigation in the state of the Propriet of Landships share in the Phylippin	1
建筑 新教 法保险证据	Discuss in beief the factors affecting surface finish.	200.000
and the second se		

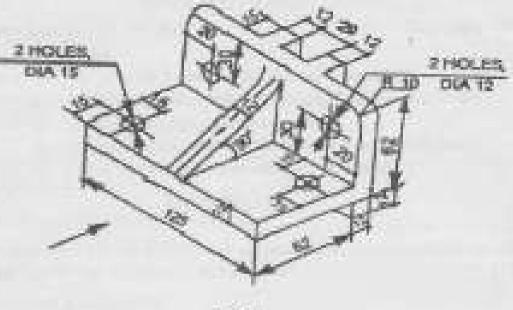
- b) Discuss in brief the selection criteria for cutting finids 543
- A mold steel billet 160 mm Dia. Was turned with a carbide tool at 30 \mathbb{C}^{2} m/min. The tool life observed was 2.1 Hr. At the cutting of 25m/min tool life observed was to be 5.2 Hr. Derive Taylor's equation for the 181 SVSTORE.
- Q4) Write short notes on (Any Four):
 - Types of chips 28 B
 - Tool insterials 5Y
 - eh: Tool signature
 - Tool dynamousters di.
 - Tool wear 63.
 - Ð Form tools-

SECTION - II

(25) Design and draw near dimensional drawing in three views with one sectional view of a jig for drilling two holes @12 as shown in fig. 11. Show clearly the details of location, clamping and guiding elements. Assume this as a final [26]operation.

[161

Design and draw neut dimensional drawing in three views with one sectional view of a milling fixture for milling the 20 ± 0.05 mm wide alot at the component shown in fig. II. Show the details of location, clamping and setting of cutter. Assume this as a final operation.



110-01

Q6)	a0 -	Lun the different methods of reducing cutting forces in press wor Explain what is shear on junch.	\$102. [6]
	b }	Explain with next sketch what is strip inyout in press working.	[6]
Q7)	4	List the methods of distributing the depreciation and explain any method in detail.	/ cese [6]
	b) :	Explain the concept of machine tool replacement.	[6]
(28)	Wri	te short notes on any two.	[12]

- a) Economics of tooling
- b) Quick setting mit
- c) Press working terminology
- d) Center of pressure.

S = 1520 Total No. of Pages (3

Seat	_
No	

T.E. (Mechanical) (Part - I) (Semester - V) Examination, May - 2015 METROLOGY AND OUALITY CONTROL (New)

Sub. Code : 45564

Day and Date : Snineday, 30 - 95 - 2015 Time : 02.30 p.m. to 05.30 p.m. Total Marks (100)

Instructions : 1) Answer any three questions from such section.

2) Figures to the right indicate full numbs.

(5) Draw next labeled sketches wherever measury.

4) Assume if necessary mitable data and state three churdy.

5) Use of non-programmable calculators is allowed.

SECTION-1

Q1) a) Discingtooh between measuring instruments and comparitors. [8]

b) Explain the procedure to transfer line standard to end standard. [8]

- (Q2) a) Explain Taylor's principle of gauge disign. What do you must by gauge makers tolerance and wear allowance. [8]
 - b) Calculate tolerances and limits for hole-shaft pair designated as Φ45H7g6 and also determine the minimum and maximum clearance. The dimension Φ45 lies between the range 30-50mm. Fundamental deviation of g-shaft in -2.5D⁺¹⁰. The standard telerance is given by i = 0.45D⁽²⁾ = 0.001D(microns) [8]
- (Q3) a) Explain the principle of interference of light and state the necessary conditions for interference of light. [8]
 - b) Explain the use of size har for measuring on angle with the help of next sketch and state its limitations.
 [8]

P, T, O.

S - 1520 [18]

(24) Write short notes on (any three):

- ii) Slip gauges
- b) Signus comparator
- c) Auto-collimator
- d) Measurement of convex surface ration
- (c) Flatness testing of surface phote

SECTION - H

- Q5) a) State the various elements of a screw thread. Explain 3 wire method to measure the effective diameter of screw thread. [8]
 - b) Explain the use of gear tools wender callper for the measurement of gear tooth thickness. [8]
- (06) a) Define quality control and state the objectives of quality control [6]
 - b) Following data was obtained for diameter of a component from shop theor, Construct X and R chants and state whether the process is in control or not. [10]

Sample No.	x.	R
L.	\$0.04	0.07
2	50.24	0.08
3	50.14	0.03
2242	50.08	0.05
5	50.28	0.04
6	30.16	0.09
7	50.30	0.04
8	50.10	0.04
9	50.16	0.05
10	50.10	0.07

For a sample of size "5" take A2=0.577, D4=2.114, D3=0

S - 1520

1181

11.

- (27) a) Differentiate between 100% inspection and sampling inspection [8]
 - b) What is cost of quality and explain cost of fullure, cost of appraisal and cost of provention. [8]
- (28) Write short notes on (any three) :
 - a) Tomlinson surface meter
 - b) Pitch measuring machine
 - c) Parkinson gear testur
 - d) Chance causes and assignable causes
 - a) Operating characteristics curves

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P-507 Total No. of Passes : 4

Seet. Na.

T.E. (Mechanical) (Semester - V) (Old) (Pre-revised) Examination, April - 2016 THEORY OF MACHINES - II Sub. Code : 45549

Day and Dote : Friday, 29-84-2016 Time : 10.30 a.m. to 1.30 p.m.

Total Marks ; 100

161

16E

[10]

Instructions |

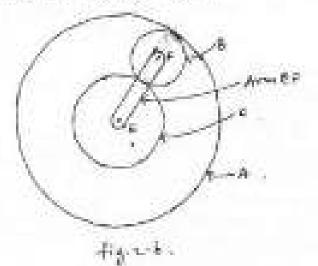
- Amongo any three questions from tack median.
- 2) Figures to the right indicate full marks.
- 30 Assume saitable data, if necessary and state clearly-

SECTION - I

Q(1) a) Derive the expression for efficiency in case of spiral gears.

b) Apinion having 30 teeth drives a gear having 80 toeth. The profile of the pears is involute well: 20° pressure angle, 12 mm module and 10 mm addendmin. Find the length of path of creatact, act of contact and the contact ratio. [10]

- (2) ii) Write a note un various types of gear trains.
 - b) An epicyclic gear train is shown in fig.1.h.



 ETO_{c}

The annular gear A has 72 teefs and meshes with gear B. Gear C has 3 touth and is engaged to Gear B. Arm EF which curries gears B and (initiates at a speed of 18 r.p.m. If gear A is fixed, determine the speed r gears B and C.

- Q3) a) Write a note on stability of a two-wheeler while taking a turn. [6]
 - b) The turbine rotor of a ship has a mass of 8 turines and a radius egyration of 0.6m. It rotates at 800 r.p.m. clockwise when looking for stem and. Determine the gyroscopic couple and its effect if the shitravels at 40 km/hr and stears to the left in a curve of 75 m radius. [10]
- Q4) a) Explain balancing of acteral masses rotating in the same plane. (6
 - b) A, B, C and D are four masses curried by a musting shaft at iadii 18 mm, 240 mm, 120 mm and 150 mm respectively and the masses of B, C and D are 30 kg, 50 kg and 40 kg respectively. The phases containing masses B and C are 300 mm sport. The angle between the planes containin B and C is 90°. B and C make angles of 210° and 120° respectively with D in the same sense. [12]
 - Finit 1) The magnitude and angular position of A and

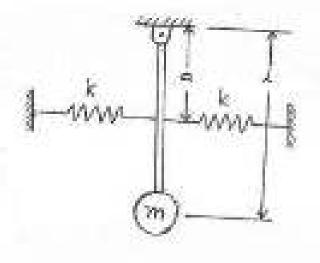
The position of planes A and D.

SECTION - II

Q5) a) With the help of near sketch represent vector method to represent vibratory motion and derive the relations between displacement vector velocity vector and acceleration sector. [8]

P-50

A pendultara consists of a stiff weightless cost of length / canying a m-34 m on its ead as shown in Fig. 5b. Two springs each of stiffices t : attached to the rod at a distance a from the upper end. Determine (natural frequency for the small oscillations.





- What is meant by essionib damping? Explain the rate of decay o Official nacillations in this case. 881
 - b) A body of 5 kg is supported on a spring of stiffness 200 Nits and has dashpot connected to it which penduces a resistance of 0.092 N at a velocity of 1 em/ace. In what ratio will she amplitude of vibration be reduced after 5 cycles. 181
- (0.7)(z): Derive an expression for amplitude ratio of a single degree freedom system. subjected to humonic excitation Famot. 181
 - 51 A 1000 kg machine is mounted on four laboriteal springs of total spring constant K and having regligible champing. The machine is subjected to a Iterationic external force of amplitude F₀ = 490 N and frequency 180 upm. Determine the implitude of motion of the machine and maximum force transmitted to foundation because of the unbolanced force when k = 1.96 = 10° N/m. 1101

P-507

- Describe the phenomenon of "whiching of shaft" and derive the formula 087.0for amplitude of vibration of shaft rotating with angular sport 'w' having s single disc of mass 'm' mounted at centre. The C.G of disc has consulticity 'e' with geometric centre of disc. Assume that there is no 381
 - A machine is supported by four isolators, each having stiffness of 3500 **F**(1) Note and damping coefficient of 50 N-s/m. A machine is to be isolated from a support barving an amplitude of 0.05 mm at 60 radises. If the total mass of machine is 59 kg. Determine, the amplitude of vibration of mathine.

181

P- 508 Total No. of Pages (3

Seat 1	 -	-	11
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1.000			

T.E(Mechanical)(Part-III)(Semester -V)(Old)(Revised) Examination, April - 2016 HEAT AND MASS TRANSFER Sub. Code: 45550

Day and Date (Saturday, 30 - 04 - 2016) Time (10.30 a.m. to 1.30 p.m.

Total Marks (100)

Enstructions r

- Solve any three questions from each metion.
- 2) Write suitable ascaraptions wherever necessary and state it clearly
- 3) Figures to the right indicate full marks.
- Use of scientific calculates is permitted.

SECTION-I

- Q1) a) What do you mean by thermal conductivity what is the effect of temperature on thermal conductivity for various engineering material.[8]
 - b) A thick walled tube of stainless steel is 20 mm inside diameter and 40 mm outside diameter is covered with a 30mm layer of asbestos insulation Ck=0.2 w/mk if the inside wall temperature of the cylinder is maintained at 600°C and the outside insulation at 1000°C, calculate the heat loss per order length of the pipe orglacting the resistance of stoirless steel pipe.[8]
- Q2) a) Derive the expression for temperature distribution and heat transfer for a plane wall with uniform heat generation [8].
 - 5) The temperature on the two surfaces of a 25 mm thick steel plate(k=40W/ mk),having a uniform volumetric heat generation of 30×10⁵W/m³ are 180°C and 120°C. Neglecting the end effects determine:
 - i) The temperature distribution across the plane wall
 - The location and the auximum temperature in the slids.
 [8]
- Q3) a) Derive the expression for temperature distribution and heat transfer for a infinitely long fin. [8]

RTO.

P - 508

b) A mercury thermometer placed in oil well is implier to measure temperature of a compressed air flowing in a pipe. The well is 140 mm long and is made of steel (k=50 W/m*C) of 1nm thickness. The temperature recorded by the well is 100°C, while pipe wall temperature is 50°C. Heat transfer coefficient between the Air and the well is 30W/m*C. Estimate true temperature of air. [8]

Q4) Write short notes(any three)

[18]

18.

- a) Redistionshield.
- b) Plank's distribution law
- c) Radiation shape factor
- d) Spectrum of electromagnetic radiation
- e) Radiation heat transfer between concentric cylinders.

SECTION-II

- Q5) a) What are the various dimensionless numbers used in convection heat transfer? Give the significance of each number. [8]
 - b) A Nuclear mactor with its curv constructed of parallel vertical plates 2.2m high and 1.4 m wide has been designed on free convection heating of liquid bianuth. The maximum temperature of plate surface is limited to 960 °C while, the lowest allowable temperature of bianuth is 340 °C, calculate the maximum possible heat dissipation from both the sides of plate. Use the following co-relation

Nu=0.13(Gr.Pr)⁰⁰⁰ The thermodynamic properties of bismuth are: µ=0.000867 Nim=s, Cp=150.71/kg *C, K=13.02Wim *C, β=1.08×10=3k⁻⁹

- Q6) a) Analyse the problem of forced convection by using dimensional analysis technique. [8]
 - b) A tube 5 m long is maintained at 100namic properties of bismuch are: μ = 0.000867N/m-a, Cp=150.7 Mkg °C by steam jacketing. A fluid flows through the tube at the rate of 2040kg/hr. at 30°C, the diameter of the tube is 2cm find the average heat transfer coefficient. Following are the properties of fluid:

ρ=850kg/m²,Cp=20005/kg²C, K=0.12W/m²C, μ=19.8×10=5 N=s/m² Use Nu = 0.023 Re^{3#} Pr^{0.0}. [8]

- Q7) a) Derive the expression for LMTD for parallel flow heat exchanger, state the assumptions made. [8]
 - b) The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2kg/s and 0.5 kg/s respectively. The inlet temperatures on the hot and cold sides are 75°C and 20°C respectively. The exit temperature of hot water is 45°C. If the individual heat transfer coefficients on both sides are 650 W/m²°C, calculate the area of the heat exchanger. [8]

Q8) Write short notes on the following (any three)

- a) Fick's law of diffusion.
- b) Overall host transfer co-efficient for hest exchanger.
- c) Hest pipe.
- d) Boiling and condensation.

-3-

[18]

P-509 Total No. of Pages : 7

T.E. (Mechanical) (Part-I) (Semester-V) Examination, May - 2016 MACHINE DESIGN-I

Sub. Code: 45551

Day and Date : Monday, 02-05 - 2016 Time : 10.30 a.m. to 1.30 p.m.

Stat. No.

Total Marks : 100

Instructions : 1) Answer any three questions from each section.

- 2) Figure is the right indicates full marks.
- Make suitable assumptions wherever required and state the same clearly.

SECTION-I

- Q1) a) Explain the various factor influencing the selection of material for a particular application. [6]
 - b) Suggest with justification the suitable material for the following components- [6]

Lathe bell.

ii) Crank shaft.

iii) Stargical instruments

- c) State the different theories of failure & explain one of them. [6]
- Q2) a) Which are the different types of keys used for shefting. Explain the design procedure for sunk key. [6]

RTO.

 b) Design a turn backle for an axial load of 50 kN. All parts are made of steel having following properties: [10]

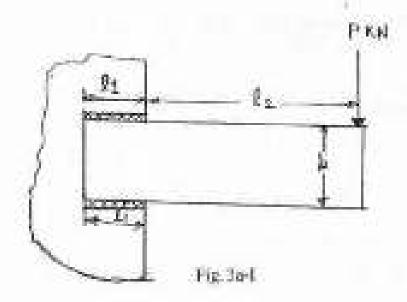
Allowable tensile stress (f) = 140 N/mm².

Allowable shear stress (f.) = 75 Nimm³

Allowable crushing stress (11) = 160 Nimm3.

Draw critical areas where failure is likely to take place & draw a sketch of turn buckle showing important dimutations.

(Q3) a) Explain the design procedure of eccentrically loaded welded joint subjected to primary shear stress due to direct load and secondary shear stress due to turning associat as shown in Fig. 3a-l. [6]



(b) A bracket is bolted to a vertical pillar using six bolts, 2 bolts in each new as shown in Fig. 3b-1. The bracket carries a load of 24 kN. Assuming tonaite stress for the bolt material as 80 MPs determine the bolt size.

[10]

P-509

P-509

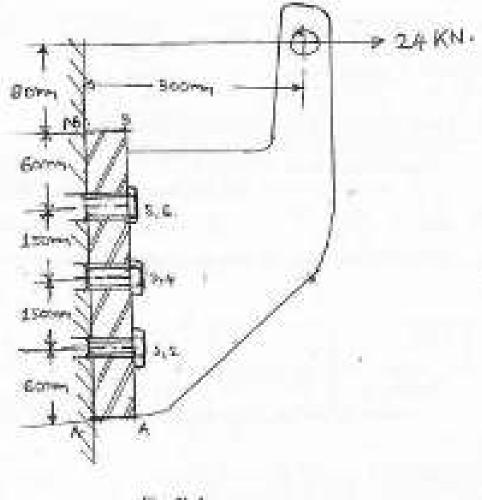


Fig. 3b-1

- Q4) ii) Discuss the advantages of weided joints over the holted and riveted joints. [4]
 - b) Design the rigid flange coupling to transmit 40 KW at 180 rpm. Overlead factor for the application is 1.5. Allowable shear stress for the shaft material is $(f_g) = 79$ MPa; for key and bolt material premissible shear stress is 80 MPa and crushing stress is 240 MPa. Allowable shear stress for flange material is 16.67 MPa. No. of bolts used are 4. Draw a dimensional sketch of the coupling. [12]

P-509

SECTION-II

- Q5) a) Explain the stresses induced while designing a helical compression spring along with next diagrams. [6]
 - b) Design a belical compression spring for a maximum load of 1000 N for a deflection of 25 mm, using the value of spring index as 5. The maximum permissible altear stress for spring wire is 420 N/mm² and modulus of rigidity is 84 kN/mm². Also show next sketch of the spring, Take Whal's

factor $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$. The still wire gauge (SWG) number and corresponding diameter of agring wire is given in following table. [10]

SWG	1	2	3	4 .	5
Diameter (mm)	7.630	7,010	6,401	5.893	5.385

- (Q6) a) What do you understand by overhauling and self locking of power screw? How does it affect the efficiency of screw? [6].
 - b) A triple start square threaded screw is used to raise a load of 50 kN. The screw has a nominal diameter of 50 mm and pitch of 8 mm, height of nut is 40 mm and coefficient of friction between nut and screw is 0.12. There is no collar friction. Find the maximum shear stress induced in the screw and nut threads. Also find the bearing pressure between screw and mit. [19]

- Q7) a) Derive an expression for energy stored in flywheel.
 - b) A rimmed flywheel made of grey cast iron having mass density of 7100 kg/m² is used on a punching press running at a mean speed of 200 r.p.m. The punching operation consists of one quarter revolution during which the flywheel is required to supply 3000 N-m of energy. The coefficient of speed fluctuations is limited to 0.2. The rim which contributes 90% of the required moment of inertia, has a mean radius of 0.5m dos to space limitations. The cross-section of the rim is square. Determine its dimension.
- (28) a) Give in steps the procedure for selection of V-belt from manufacturers catalogue. [8]
 - b) It is required to select a flat beh drive to connect two transmission shafts rotating at 800 and 400 r.p.m. respectively. The centre-to-centre distance between the shafts is approximately 3to and the belt drive is open type. The power transmitted by the belt is 30 KW and the load correction factor is 1.3. The belt should operate at a velocity between 17.8 to 23.90 m/s. The power transmitting capacity of the belt per run width per ply at 180° are of contact and at a beh velocity of 5.08 m/s is 0.0147 KW. Select preferred pulley dimeters and specify the belt.

Refer the data given for Q. 8 (b)

[10]

P-509

18.

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Load correction factor (\mathbb{F}_{i})

	Type of load	F,
ф.:	Normal load	1.0
iŭ l	Steady load, e.g. centrifagal pumps-fans-light	
	machine tools - conveyors	3.2
ій):	Intermittent load, e.g. heavy duty	
	fans - blowers compressors - reciprocating	
	pumps - line shafts heavy duty mochines	13
iv)	Shock load, e.g. vacuum pumps - rolling mills	
	hanunars - grinders	1.5

Are of contact factor (\mathbb{F}_{q})

α_i (degrees)	120	130	140	150	100	170	180	150	200
Fa	1,33	1.26	1,19	1.13	1.08	1.04	1.00	0.97	0.94

-64

P-509

Standard widths of these belts (in ntm)

3-Ply	25	40	50	63	76					
4-Ply	40	++	50	63	76	90	100	112	125	152
5-Ply	76	100	112	125	152					
6-Phy	112	125	152	180	200				_	

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P-510 Total Na. of Pages : 4

T.E. (Mechanical) (Part - I) (Semester - V) (Ob	đ
Examination, May - 2016	S
MANUFACTURING ENGINEERING	
Sub. Code : 45565	

Day and Date : Saturday, 07-05-2016 Time : 69.30 a.m. to 91.30 p.m.

Total Maria : 100

Instructions: 1)

Seat

 Ma_{ij}

- Q.1 and Q.5 are compulsory.
- 2) Solve two questions from remaining questions of each section.
- 3) Figures to the right indicate full marice.
- 4) Assume if necessary suitable data and state them clearly.
- 5) Use of non-programmable calculators is perceivable.

SECTION - 1

- Q1) The component shown in Fig. 1 is to be processed on a single spindle automat. Study the component and prepare: [18]
 - (i) Detailed process sheet.
 - b) Tool Layour.
 - Camprofile for drilling operation.

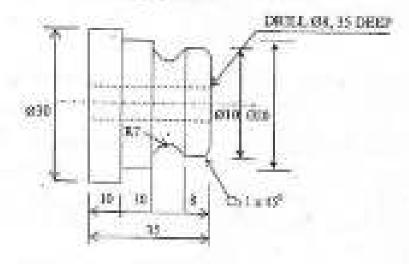


Figure 1. Majoral: M. S. 050 Bac

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P-510

(5)

		The second second
Q21 m	Derive as expression tan	C-I-rsing

Where O - shear angle.

o, make ongle.

and r ~ chip thickness catto

State assumptions made.

 b) In orthogonal cutting test with a tool signature as 12-10-6-8-12-0-0.63 die following observations were made: [8]

Chip thickness ratio: 0.35,

Horizontal composition of curting force = 1600 N

Vertical component of cutting factor = 859 N

Determine:

- in The various components of forces,
- ii) Coefficient of friction at chip tool surface
- ii) Shear strain.

Q3) n)	Explain the tool signature of single point outting tool.	191
	지수 방법에 여러 집에 있는 것이 아이지 않는 것이 같아. 이 가지 않는 것이 않는 것이 같아. 이 가지 않는 것이 같아. 이 가지 않는 것이 않는 것이 같아. 이 가지 않는 것이 같아. 이 가지 않는 것이 않는 것이 않는 것이 같아. 이 가지 않는 것이 않는 것이 같아. 이 가지 않는 것이 않는 것이 않는 것이 같아. 이 가지 않는 것이 않는 않는 것이 않 않는 것이 않는 것이 않는 것이 않는 것이 않이 않는 것이 않는 것이 않이 않는 것이 않는 것이 않이 않는 것이 않는	

(b) Explain the details in tool wear phenomenon. [10]

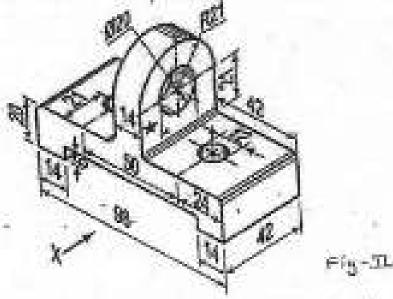
Q4) a) Explain the concept of heat generation in metal cutting and use of [8] containts. [8]
b) Explain the mechanics of chip formation with next skatch. [8]

SECTION - II

Q5) Design and deaw a next dimensional sketch is three views with one section view. For drilling two Holes 012 through as shown in Figure - II and showing clearly details of champing and location of workpieze. Assume this as final operation. [26]

OR.

Design and draw a next dimensional sketch in three views with one sectional view of a milling fixture. For milling surface (*) both sides as shown in figure - II showing clearly details of location, clamping of workpiece and cultar secting. Assume this as a final operation.



Q6) a) Discuss sactions of reducing cutting forces in press working. [6]

b) Explain the following terms in press working.

161

- i) Spring back Effect
- ii) Clearance
- ito Strip kolout

Q7) a)	Differentiate between	
	i) Direct cost and indirect costs.	
	ii) Fixed cost and variable costs.	[6]
6)	List the basic methods for replacement and selection any one rotthod.	n of tools and explain [0]
Q8) Wr	the short notes on (Any two) :	[12]

a) Design principles common to Jigs and fixtures.

b) Centre of pressure and knockouts.

c) 3-0-1 principle.

0

d) Indexing elements.

P-511 Jour Nr. of Pages 17

Sent Na:

T.E. Mechanical (Semester - V) (Pre - revised) Examination, May - 2016 CONTROL ENGINEERING Sub. Code : 48709

Day and Date : Manday, 09-48 - 2016 Time (10.30 atm, to 1.30 p.m.

Testregilana:

Tatal Marks : 100

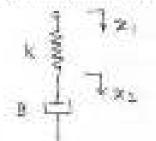
11 Attemptany three questions from Section Land Section II.

2) Assume any additional data if require dand mention it clearly.

31 Figures to right indicates followards.

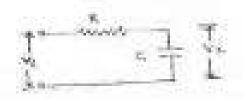
SECTION - J

(Q1) a) Show that the system shown in figure 1a and 1b are analogous. In figure 1a s, and s, represents input and output displacement respectively. [8]



prerine.

Figure 1-4

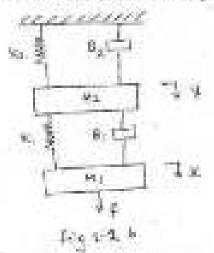


Trease 1.4

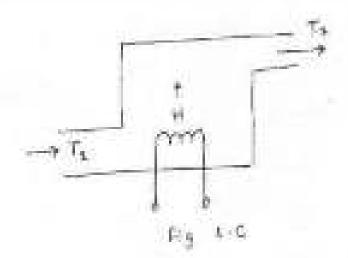
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P-511

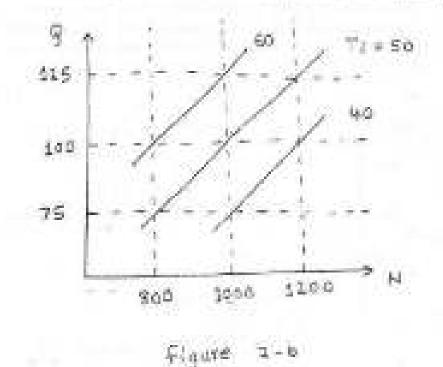
 Drow generated chair representation for the mechanical system shown in tigger 1, th and communic pleast cell circuit using force mattern analog [0]



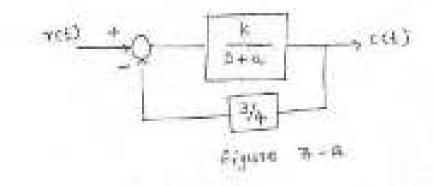
 Obtain mathematical model for the thermal system shown in figure he, where T₁ is notice temperature of sir, T₁ is infet temperature of sir and H is heat argue.



Q2) a) Benerative linear approximation for the equation of volume of spheric given by V = gR²H, where r is radius of the base and H is altitude. [8] 10 The characteristics curves of an engine are given by the family of curves shown in flipsee 20. Determine the linear approximation for the too quet [8].



Q3(a) The block diagram for a jet pipe and iller its hows in figure its Determine is not a such that the amplifier will have a mostly state gain of 1 and a time constant of 0.25 sec. [9]

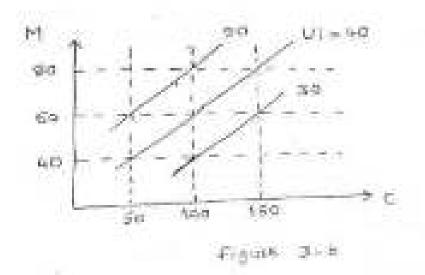


234

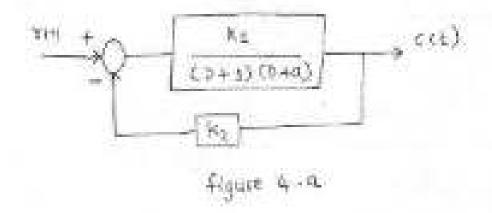
P-511

b) The sideally state operating our can for a system to be deniro Bid any shows: in figure 3h. The arfecture operating conditions are V = C = 100, U = 40 and SI = 60. Despirition the values of W and Ka., Determine the required alops of controller lines such that when the lead changes from #0 to 90, the output c will not change by areas than 2 min. For Ku. Us determine the value of A societher g = x, when g = 0. [36]

P-511

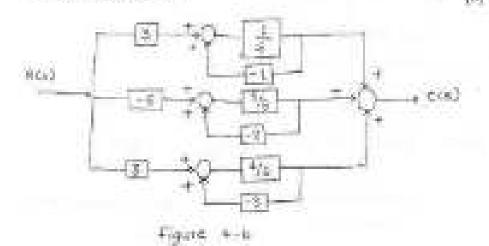


Q4) all For the proportional control system shown in figure 4n, determine k., k. and a such that system will have a steady state gain of L, a stand for procy of 2 and complex ratio of 0.5. [9]



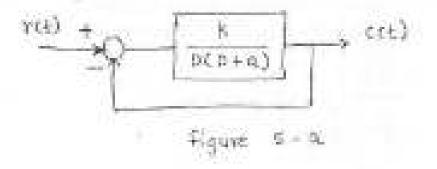
(4n)

Find transfer function for the system shows in Figure 4b, using block disgram reduction rules. [8]



SECTION - II

Q5(4) Determine the varies of k and a far fae system shows in figure 5a such that the afternative tries equation has a real root at -1 and at -5. Also determine response (it) when it) = 0 and ((0) = 4, C(0) = 0. [8]



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P-511

P-511

The open loop transfer function of unity feedback system is given by

K S(1+0.4S)((+0.22S)^{*} Findrange of value of K so that the descellary series increased at the stable [8]

- Q6) a) Sketch the must form for the function G (S) $R(S) \approx \frac{R}{S(S^2+4S+13)}$, (10)
 - b) Ottentible dataping ratio, peak time and park overshoot for the system shown in figure 6b [9]



 (Q7) a) Seriest control system is described by the differential equation
 y(t) = <u>T(19+5)</u>
 y(t) = <u>T(19+5)</u>
 f(t). Describes the computer diagram and
 state space opposition by direct and parallel programming method. (9)
 Determine state space representation for the system shown in figure 7h (8)

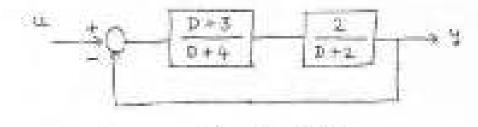


Figure 7-10

6-

P-511

QRI a) First response of line order could system to only impalanted and any rep further. When all initial conditions are zero. [9]

b) A segment programming to find computer diagram and state space world.

for the system beying transfer function $\frac{C(S)}{R(S)} = \frac{(S+S)}{S(S+2S+2S)}$ [8]

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13.

24-58 Total No. of Pages 13 Sect Nu T.E. (Mechanical Engineering)(Part-I)(Semester -V)(Revised) Examination, April - 2016 THEORY OF MACHINES-II Sub. Code:66242

Day and Dete: Saturday, 20-24-2016 Time (10.30 mat. to 1.30 p.m.

Total Marks :100

P. 412

and the second	Internetion: 1) All questions are compelsory.
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- Figures to the right indicate full marks. 13^{-1}
- Draw next labelled aketeins wherever appearance, 35
- Assume if necessary suitable data and state clearly. 43
- 23 Use of Non programmable calculator is permitted.
- (Q1) a) Prove that the condition for musimum efficiency in case of spiral gear.

 $is \alpha = \frac{\theta + \phi}{\alpha}$ where $\phi = friction$ angle, $\theta = ahaft$ angle and $\alpha = spiral$ angle on the driving wheel. [8]

 $OR_{\rm c}$

Derive an expression for minimum number of teeth required on wheel to avoid interference in mesh with scar.

- Two mating involute goars of 20° pressure angle, number of teeth on 101 pinion 20, gear ratio 2, speed of pinion 250 rpm, nodule 12 mm. If the addendum of each wheel is such that the path of approach and path of recess up each side are half the maximum possible length each, find
 - 8 addendum for both the wheels,
 - 17 length affare of contact.

Exploit the working of Differential gear of an automobile. 161 (02)

OR:

ETO

1101

P - 512

Motor shaft A events a constant torque and is grand to shaft B. The speed of shaft B is G times the speed of motor. Show that the suggiout

noteleration of the shaft B is maximum when $G = \sqrt{(I_a / I_b)}$ where, I_a and I_a are the total mass moments of inertia of revolving parts standard to the respective shafts.

- b) An epleyelic tints of gears is arranged as shown in fig. 2b. How many revolutions does the arm, to which the pinions B and C are stached, make. [10]
 - When A makes one revolution clockwise and D makes half a revolution anticlockwise.
 - ii) When A masses one revolution clackwise and D is stationary? The number of toeth on the gears A and D are 40 and 90 respectively.



- Q3) a) Explain the effect of gyroscopic couple on ship during steering pitching and rolling. [9]
 - (b) Each read wheel of a motor cycle has a mass moment of mentil 1.5 kg/m². The rotating parts of the engine of the motor cycle have a mass moment of mentil of 0.25kg/m². The speed of the engine is 5 times the speed of the wheels and is in the same sense. The meas of the motor cycle with its rider is 250kg and its center of gravity is 0.6m above the ground level. Find the angle of wheel if the motor cycle is travelling at 50km per hour and is taking a time of 30 m method. Wheel diameter is 0.6 m. [10]

Q4) a) Explain different types of dynamic forces acting is single slider orank. clasin mechanikm. [6]

OR:

What conditions are to satisfied for a system to be dynamically equivalent to a given system.

- b) Connecting roll of a gas engine has mass of 70kg and has a addus of gyration of 36 cm, about rais through the centre of gravity. The length of the rod between centres is 100 cm and the centre of gravity is 33 cm from the crank pin centre. If the mask length is 22.5 cm and revolves at a uniform speed of 270 rpm. Determine the magnitude and the direction of the insertia force on the rod and the corresponding torque on the crank shaft when inclination to innor dead centre is 30⁶. [10]
- Q5) a) Explain why reciprocating masses are partially balanced.

161.

03.

Explain the balancing of several masses rotating in same plane.

- b) A five cylinder indine angine mining at 750 rpm has successive cracks 144° sport, the distance between the cylinder lines being 375 mm. The piston stroke is 225mm and the rotin the connecting rod to the crack length is 4. Examine the engine for balance of primary and secondary forces and couples and find their meximum values. The reciproceting roass for each cylinder is USkg. [12]
- (Q6) a) Explain macheum fluctuation of energy and coefficient of fluctuation of energy.
 - b) The turning moment diagram for a point length is drawn to the following scales: Turning moment length 5 N-m, crank angle 1mm = 1°. The turning moment diagram repeats itself at avory half revolution of the engine and the areas above and below the mean turning moment line taken in order, are 295, 685, 60, 340, 960, 270 mm². The rotating parts are equivalent to a mass of 36kg at a radius of gyration of 150 mm. Determine the coefficient, of fluctuation of speed when the engine runs at 1806 spin. [10]

of the

-34

P-513 Tatel No. of Pages 14

T.E. (Mechanical) (Part-III) (Semester-V) Examination, May - 2016 HEAT AND MASS TRANSFER

Sub. Code: 66243

thay and Date : Monday, 02-05 - 2018 Time : 10.58 a.m. to 1.30 p.m. Total Marks : 100

introduces 11-

Sect 266

- All questions are congrillory.
- 2) Figure to the eight fod instea Tell marks.
- 3) Assume within data when we unreasing and state it clearly.
- 43 Use of specific coleidators is parmitted.

Q1) Solve Any Three:

- a) Define critical radius of insulation. Also derive the equation for critical radius of insulation for hollow sphere. [6].
- b). What are the modes of mass transfer? Explain Ficks law of diffusion.

{6}::

- c) Air at 90°C flows in a copper tube (k = 384 W/mK) of 4 cm inner diameter and with 0.6 cm thick walls which are based from the outside by water at 125°C. A scale of 0.3 cm thick is deposited on outer surface of the tube whose thermal conductivity is 1.75 W/mK. The air and water side heat transfer coefficients are 221 and 3605 W/m/K, respectively. Find overall heat transfer coefficient on the outside area basis. [6]
- (a) A steam pipe is covered with two layers of insulation. The inner layer (k = 0,17 W/mK) is 30mm thick and the outer layer (k = 0.023 W/mK) in S0mm trick. The pipe is made of steel (k-58 W/mk) and has later diameter and outer diameter of 160 mil 170 mm, respectively. The temperature of seturated steam is 300°C and the ambient air is at 50°C. If the inside and outside heat transfer coefficients are 30 and 5.8 W/m/K, respectively, calculate the rate of heat has per unit length of pipe. [6]

BTO.

Q2) Seive Acy Two:

- Explain Enumped heat capacity analysis. Alongive the physical significance of Biot matcher. [8]
- b) Steel ball bearings (k = 50 W/mK, ac = 1.3 × 10⁻⁶ m²/s) having a diameter of 40mm are heated to a temperature of 650°C and then quenched is a task of oil at 55°C. If the heat transfer coefficient between ball bearings and oil is 300 W/m/K. Determine the duration of time the bearing must remain in a oil to reach a temperature of 200°C. (8)
- c) A plate 2 cm thick and 2 cm wide is used to best a fluid at 30°C. The best generation rate inside the plate is 7 × 10° W/m². Determine best transfer coefficient to malorain the temperature of the plate below 180°C. Use k for plate 26 W/mK. Neglect heat losses from the edge of plate.

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Q3) Solve Any Two:

Explain the error estimation of temperature measurement in the mowell.
 [8]

- b) Anoil filled thermometer well made of a steel tabe (k = 55.8 W/mK), 120 mm long and 1.5 mm thick is installed in a tabe through which air is flowing. The temperature of air stream is measured with the help of thermometer placed in the well. The surface heat transfer coefficient of the air stream measured with the help of a thermometer placed in the well. The surface heat transfer coefficient from the nin to the well is 23.3 W/m/K and the temperature recorded by the thermometer is 88 °C. Institute the measurement in error and the percentage error if the temperature at the case of the well is 40°C.
- c) An aluminitum alloy fin (k = 208 WimK), 5.3 mm thick and 2.5 mm long prostates from the wall. The base is at 420°C and ambient air temperature is 30°C. The local transfer coefficient may be taken as 11 Wim³K. Find the best loss and fin afficiency, if the best loss from the finitip is negligible.

[8]

Q4) Solve Any Three of the following:

- Analyze the problem of naminal convection by using dimensional analysis technique.
- b) Write a abart note on thermal boundary layer. (5:
- c) Consider a design of machine number using free convection of liquid biomult. The centre core is constructed of parallel vectical plates of 2m high old 1.3m widw. Find the maximum possible heat dissipation from both side of each plate if the surface temperature of the plate is 950°C and lowest allowable biomuch temperature is 350°C. Properties of biomult are, p = 10050 kg/m², Cp = 0.15 k3/kg K, k = 11.2 W/mK, μ = 0.7 × 10°. N sector, β = 1.3 × 10° 1/K. Use the correlation N₀ = 0.13 (Gr. Pr)¹⁰.
- d) 50 kg/minute of water is itested from 30°C in 50°C by passing drough i pipp of 0 cm diameter which is maintained at 100°C, find the length of the pipe required, the properties of water are p = 965 kg/m³, Cp = 4208 J/kg/K, k = 0.585 W/mK, v = 0.33 = 10⁻⁶ m³/sec. Use the correlation Nu = 0.023 Ra¹⁰, Pa²⁰⁰ [5]

Q5) Solve Any Three of the following:

10.	State and explain Kirchhoff's law,	[5]
10	Write a short note on Reclintion shape factor.	$ \mathbf{b}\rangle$
49	The temperature of a flame in the flamace is 3900 K. Find $\lambda_{\rm sec}$	(5)
di.	The inner solvery of a liquid exceen complete is 30ew in diamet-	inane.

67 The interspirate of a inquicibly gen dominate is some in dameter and outer spirate is 36 cm in diameter, both spheres are having emissivity at 0.05. Detension the heat leakage rate in to the liquid oxygen container which is at -183°C. [6]

P-513

(6) Selve Any Three of the following:

- a) Derive the expression for LMITD for counter flow heat exchanges [6]
- Write a short note on design considerations of heat exchanges.
- What do you mean by condensation? Wisa are the types of condensation? Which type of condensation is preferred? Justify you: survey. [5]
- d) Thraw the temperature distribution for the disllowing heat exchangers. [6]
 - Condensen.
 - Evapeontor.
 - (iii) Consister flow hem exchanger hissing upped heast engagelies.
 - iv) Counter flow heat exchanger baring effectiveness equal to unity:

80000

P-515 Total No. of Pages : 4

T.E. (Mechanical) (Semester - V) (Revised) Examination, May - 2016 MANUFACTURING ENGINEERING Sub. Code : 66245

Day and Date: Saturday, 87-05-2016 Time (9.30 a.m. to 1.30 p.m. Tetal Marks: 101

Instructions: 1)

Seri No.

All questions are compalitory.

1) Figures to right indicate full merks to the question.

3) Anorma if necessary custable data and state them shortly.

① Use of non-programmable calculators is permissible.

Q1) Selve my two:

- Explain the different types of chips formation with next labeled diagrams. [8]
- b) What is machinability, Explain various factors affecting machinability.[8]

 Following observations were made during orthogonal cutting oparation of a diameter 50 mm M.S. bar. Depth of cut = 1.2 mm, cutting force = 1000 N, feed force = 300 N, spindle speed = 240 mp.m., feed = 0.2 mm/ rev, chip thickness after cut = 0.5 mm, rais angle = 120°. [8]

Find out it Shear place angle

- ii) Cutting velocity, thip velocity and shear velocity,
- iii) Coefficient of friction between chip and tool.

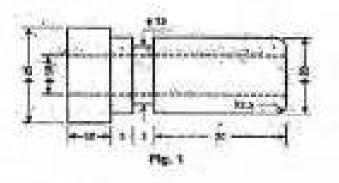
Q2) Solve any two

a) Define tool life. Discuss various factors affecting tool life. [8]

PTO

P-515

- b) Draw tool geometry of a milling outer and explain nonancisture in detail.
 [8]
- c) A ratbide tool with mild steel workpiece was found to give a life of 2 hours while cutting at 60 m/min. Compute the tool life if the same tool is used at a speed 30% higher than the previous one. Also determine the cutting speed for required tool life of 180 minutes. Assume Taylors Equation as V T ⁶²⁶ = Constant. [8]
- Q3) The component shown in fig. 1 is to be processed us a single spindle automat. Study the component and creptre: [18]



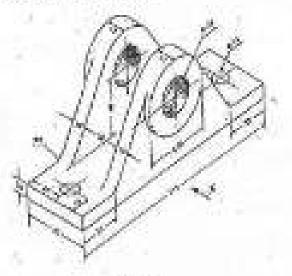
Material - \$ 25 polish brass bar

All dimensions are in mnt. (Fig. not to scala)

- a) Detailed process sheet
- Teal inpast.
- c) Camprofile for drilling operation.

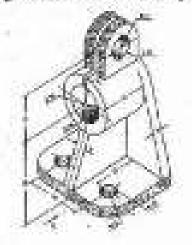
Q4) Solve my one

 a) Design and draw neet dimensional drawing in three views with rate sectional view of a jig for drilling two holes of \$12 through as shown in fig.4a. Show clearly the details of clamping and location of workpicce. Assume this as a final operation. [26]





b) Design and draw a next dimensional sketch in three views with one sectional view of a milling fixture for milling 3± 0.05 one wide slot at the component as shown in fig 45. Show the details of location, clamping and outlet setting. Assume this as a first operation. [26]





234).

[12]

Q5) Solve any two

- With near sketch write down different types of dies.
 [6]
- b) Find the total pressure, dimensions of tools to produce a washer Sem outside diameter with a 2.4 cm hole, from material 4 mm thick, having a shear strongth of 360 N/mm³.
- Discuss design considerations for die element. [4]

Q6) Write Short notes on any three:

- Work holding devices in CNC.
- b) Automatic tool changers.
- c) Automotic pallet changes.
- d) Tool materials and tool grometry signature of CNC.

4

P- 796 Total No. of Pupes 13.

T.E.(Mechanical Engg.)(Part-I)(Semester -V)(Old) Examination, May - 2016 METROLOGY AND QUALITY CONTROL Sub. Code: 45564

Day and Date (Taysday, 03-05-2016) Time :10.39 a.m. to 1.30 n.m.

Sect. No.

Treat Maries (100)

- Instructions: 11 Answer any three questions from each specion,
 - Figures to the right indicate fall muchs. 74.
 - ж. Draw next figures wherever nerosary.
 - Assume suitable data only wherever necessary and state tinns clearly. 46.
 - SL Use of non-programmable culculator is permitted.

SECTION-I

- Explain briefly classification, care and use of alip gauge with the help of 00150figures, $\{\mathbf{N}\}$
 - What is essential purpose to a limit system? Explain three different types**b**)of fits using figures. 181
- Explain with next skatch construction and working of vernier call per [8]. (72) (a)
 - Calculate the fundamental deviation and tolerances and hence the limits. 51 of size for the shaft and hole peir designated as 55 mm H -C. The talmance limit is given as.

i= 0.45 8/D + 0.001D Microma

The diameter steps are 50 mm and 80 mm. The tolerance grade for number 8 quality is 2% and for number 7 quality is 16i. 181

- Describe with next sketch exclain the measurement of concave and 031 at circulars arefarat radius. 181
 - Efficients the use of autocollimator, for obecking flatness of the surface 83 elate. [8]PTO.

P - 796

Q4) Write sheet notes on any three

[18]

- (d) Line and end measurement.
- b) Level beam comparator
- c) Dial gauges
- (f) Hole base system and shaft base cystem
- e) Clinometers,

SECTION-II

Q5) a)	Describe the construction and working of any one instrumet surface finish measurement.	n teasi in [8]
b)	Describe different errors occurred in a screw thread.	[8]
Q6) #)	Explain Parkimann's gear tester with sketch.	[8]
b)	What do you know by cost of quality and value of quality balance them?	7 Hos to [8]
Q7) #)	Explain operating characteristic curves with near sketch.	[8]
44	with the state of the terror terror state of the fractions from the factors	

 Table given below shows number of defectives found in inspection of a Ini for 100 plags each plot a P chart and check a process is in control or not.

Lot Number	1	2	3	4 5	-6	7	8	g.	10
Number of	6	3	1	4 3	0	н	\mathbb{S}	2	3
defectives			Ľ,						

Q8) Write short noise on any three

- a) Objectives of quality control.
- 5) X chart
- ij Variable inspection and antibute inspection
- d) Sampling inspection & procentage inspection
- e) AWQL and LTPD

 $\{18\}$

P - 796

P-838 Total No. of Pages 1 if

T.E. (Mech.) (Semester - V) (Revised) Examination, April - 2016 CONTROL ENGINEERING Sub. Code : 66241

Day and Date : Friday, 29 - 84 - 2016 Time : 10.30 n.m. to 1.30 p.m.

Nut

Nai

Total Marks: 140.

Instructions: 1) All questions are compulsary.

- 2) Assume cuitable data where revenues and mention it clearly,
- 3) Figures to right indicate fall marks.

 Q1) a) Construct grounded chair representation for the mechanical system shown in fig. Ia and draw electrical network using direct analog. [6]

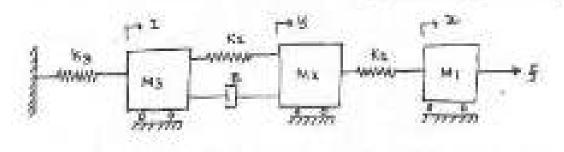
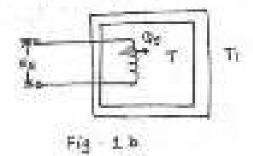


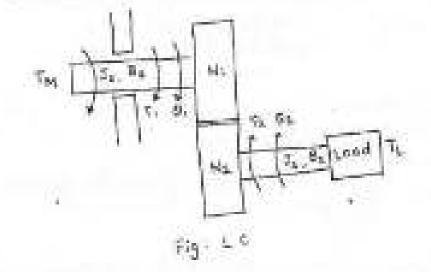
Fig . 1 . 0.

b) Furthermal system, shown in fig.1 b, find equation of T as a function of E₁ and T₁ when Q₁ = E₁.
[6]



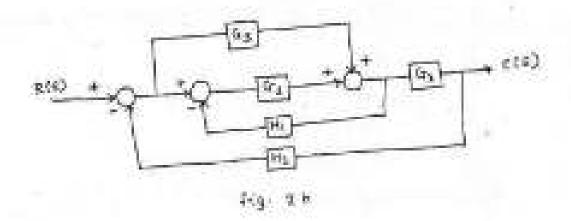
P.T.O.

For the gear train shown in fig. 1c, derive equation bases on motor torqu
 (T_) and load torque (T_).



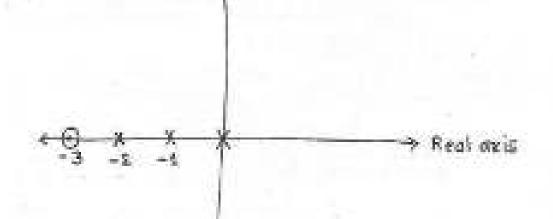
(Q2) (a) For a sortic flow of air through a restriction, the mass flow rate $M = \frac{0.53}{\sqrt{T}}$, A.F. where M is mass flow rate, T is inlet temperature, A area of restriction and P is the inlet pressure. Determine the lines approximation for M when area A is held constant.

b) Reduce the block diagram shown in Fig. 2b and find $\frac{C(S)}{R(S)}$. []



P-83

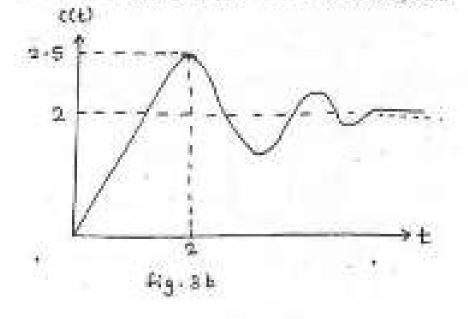
Q3) a) Pole zero configuration of the overall transfer function is shown in Fig. 3a Determine its response for unit step input. [6]



Imaginary axis

fiq . 3 a.

b) The step response of a second order criminal system is shown in figure 3b. Determine the closed loop transfer function of the system. [8]



-3-

P-838

Q49 a) Using Rouths stability criterion, determine the stability of system having its open loop transfer function has poles at S = 0, S = -1, S = -3 and zero at S = -5. Take gain K = 10.

b) Sketch root locus for
$$G(S)$$
 $H(S) = \frac{K(S+2)}{(S+1+j\sqrt{3})(S+1-j\sqrt{3})}$ [16]

Q5) a) Draw bode plot for
$$G(S) = \frac{10}{S(S+1)(S+5)^+}$$
 [10]

 b) Determine the computer diagram and state space representation for the system shown in fig. 50, using direct programming. [8].

$$f(t) \longrightarrow (p+s)(p+s)(p^2+s) \longrightarrow u(t)$$

Q6) s0 The working of a speed control system is described by the differential eq1. [8]

$$y(t) = \frac{2(D+5)}{(D+2)(D+3)(D+4)} + f(t)$$

Determine state space representation and computer diagram by general programming.

b) For a unity feedback system with $G(S) = \frac{K(S+1)}{S^2 + 4S + 3}$

Find

- angle of departure for complex poles.
- (i) only point for the root locus as it enters the real axis.



81

S = 2082 Total No. of Pages 13

Total Marks (100)

T.E. (Mechanical) (Semester - V) (Revised) Examination,

December - 2015

THEORY OF MACHINES - H Sub. Code : 45549

Day and Date : Tuesday, 08 - 12 - 2015 Time : 02.30 p.m. to 05.30 p.m.

Instructions : D. Attempt any three questions from each Section.

- 2) Figures to the right indicate full marks.
- 3) Make suitable assumptions if necessary and state them clearly.

SECTION - 1

- QD a) Derive the equation for maximum efficiency of spiral gears. [7]
 - b) The centre distance between two meshing spiral genes is 150 mm and the angle between the shafts is 60°. The generatio is 2 and the normal circular pitch is 10 mm. The driven generates a helic of 25°. [9].

Determine :

- The number of teets on each wheel.
- Exact centre distance
- ii) efficiency if friction angle is 4°.
- Q2) a) Write a note on tangues in epicyclic gear trains, [6].
 - b) An epicyclic gear train is as shown in fig 1, the input 1 turns at 180 np.m. counter clockwise, the input 2 turns at 720 np.m. clockwise. Determine the speed and direction of rotation of the out put shaft. The number of teeth on gears are

 $T_a = 20$, $T_a = 32$, $T_a = 48$, $T_a = 24$, $T_a = 36$ and $T_a = 108$. [10]

PTO

Seat. No.

 $\{6\}$

- (Q3) a) A shaft carries four A, B, C, D of magnitude 200 kg, 300 kg, 400 kg, 200 kg respectively at radii, 80 mm, 70 mm, 60 mm and 80 mm in planes measured from A at 300 mm, 400 mm, and 700 mm. The angles between the cranks measured anti clockwise are A to B 45°, B to C 70° and C to D 120°. The balancing masses are to be placed in planes X and Y. The distorate hetween the planes A and X is 100 mm between X and Y is 400 mm and between Y and D is 200 mm. If the balancing masses revolve at a radius of 100 mm find their magnitudes and angular positions. [12]
 - b) Explain balancing of V engine.
- (Q4) a) Explain the terminology of gyroscope and method of finding gyroscopic affect. [6]
 - b) A near engine automobile is travelling along a track of 100 m mean radius each of four wheels has Moment of Inertia of 1.5 kg-m² and effective diameter of 60 cm. Rotating parts of engine have M.I. of 1 kg-m². The engine axis is parallel to rear acle and crack rotates in same sense as road wheels. The back axle ratio is 3:1. The vehicle mass is 1000 kg, and has a C.G. 40 cm, above ground level. Width of track of vehicle is 1.5 m.

Determine limiting speed of vehicle round the curve for all four wheels to maintain contact with road surface if this is not cambered.[10]

SECTION - II

- Q5) a) What are the general causes of Vibration? Explain the desirable and undesirable effects of Vibration. [6]
 - b) A cylinder of mass M and radius r rolls without slipping on a cylindrical surface of radius R. Find the natural frequency for small oscillations about the lowest point. [10]
- Q6) a) Derive that the loss of amplitude per cycle for coulomb damping is given by 4F/K, where F is the frictional force and K is Spring stiffness. [8]

24

b) A 25 kg mass is resting on a spring of 4900 N/m and dashpet of 147 N-sec/m in parallel. If a velocity of 0.10 m/sec applied to the mass at the rest position, what will be its displacement from the equilibrium position at the end of the first second? [8]

- Q7) a) What are the types of forcing functions commonly encountered in engineering practice? Derive the equation for steady state response of single degree freedom system consisting of moss M.Spring Stiffness K and damping coefficient C subjected to constant homonic excitation F=F_signat. [8]
 - (b) A machine of mass 1 tonne is acted upon by an external force of 2450 N at a frequency of 1500 rpm. To reduce the effects of Vibertion, isolator of rubber having static deflection 3 mm under the machine load and an estimated damping coefficient 0.2 are used. [8]

Determine :-

- force transmitted to foundation
- i) amplitude of vibration, and
- ii) phase lag.
- Q8) a) Derive the exprission for steady state response of a single degree freedom system involving rotating urbalance. [8]
 - b) A disc of mass 4 kg is mounted midway between hearings which may be assured to be simple supports. The bearing span is 50 cm. The steel shaft is of 10 mm diameter and is horizontal. The centre of gravity of the disc is displaced 2 mm from the geometric centre. The equivalent viscous damping at the centre of the disc-shaft may be assumed as 50 N-sec/m. If the shaft rotates at 250 rpm, determine the maximum stress in the shaft. Also find the power required to drive the shaft, at this speed. Take E = 1.96 × 10¹⁰ N/m². [10]

S-2083 Total No. of Pages 13

T.E. (Mechanical) (Part - III) (Semester - V) Examination, December - 2015 HEAT & MASS TRANSFER Sub. Code : 45550

Day and Dute : Thursday, 18 - 12 - 2015 Time : 02.30 p.m. to 05.30 p.m.

Seat. No.

Total Marks : 101

Instructions : 1) Solve any three quantings from section I and section II each.

- Assause suitable data if necessary.
- 3) Figures to right indicate full marks.

SECTION - 1

- (Q1) a) Define thermal conductivity and discuss thermal conductivity for solids, liquids and gases.
 [6]
 - b) A square plate heater (size 20 cm × 20 cm) is inserted between two slabs. Slab A is 2 cm thick (k = 45 w/mk) and slab B is 0.01 m thick (k = 0.2 w/mk). The outside heat transfer coefficient on both sides of A and B are 180 and 50 w/m/k respectively. Temperature of surrounding air is 25°C. If the rating of heater is 1.2 kW. Find. [10]
 - Maximum temperature in the system.
 - Outer surface temperature of two alabs.

Draw equivalent circuit for system-

(21) a) A 10 cm OD pipe corrying saturated strom at a temperature of 195°C is tagged to 20 cm diameter with magnesia (k = 0.07 w/mk) and further lagged with huminated ashestos (k = 0.082 w/mk) to 25 cm diameter. If the surrounding air temperature is 15°C and heat transfer coefficient is 20 w/m²k find the mass of stearn condensed in 8 hrs in a 100 m length of pipe. Inside heat transfer coefficient is 75 w/m²k. Neglect thermal resistance of pipe material. (Latent heat of exoporation = 1951 kJ/kc).

100

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1.1

8-2083

133.

- b) A hollow cylinder 6 cm ID, 9 cm OD has a heat generation rate of 5 × 10° kw/m³. Inner surface is maintained at 450°C and outer surface is at 350°C Thornal conductivity of material is 3 w/mk. Determine. [10]
 - i) Value and location of maximum temperature.
 - ii) Tomperature at midthickness of cylinder.
 - iii) Sketch the temperature profile.
- Q3) a) Derive the expression for temperature distribution in a fin of finite length with instalated end. [8]
 - b) Define following terms :
 - () Emissive power ill Emissivity
 - (iii) Irradiation iv) Radiosity
- Q4) a) Show that the total emissive power of a black variable is equal to II times the intensity of radiation. [8]
 - b) A 10 mm OD pipe carries a cryogenic fluid at 80 K. This pipe in meased by another pipe of 15 mm OD and the space between the pipe is evacuated. The outer pipe is at 280 K. Emissipities of inner and outer surfaces are 0.2 and 0.3 respectively. Determine the radiant heat flow rate over a pipe length of 5m. [8]

SECTION + II

- (25) a) What are the natural convection floor patterns? Explain by drawing neut sketches. [8].
 - b) Calculate the rate of heat loss by natural convection from a outside surface of a vertical pipe of 10 cm overide dimmeter and 3 m long. The pipe has outside surface temperature of 100°C and surrounding air at 20°C.

Use suitable relation from :

Nu = 0.1 (Gr.pt)¹⁰ for 10⁴ < Gr. pr < 10¹¹

and Nu = 0.59 (Gr.pc)¹²² for 10⁴ < Gr.Pr <10⁷

The properties of air at 68°C are :

 $P_{f} = 0.696$; k = 0.02896 m/m/k; $\gamma = 18.97 \times 10^{4}$ m/m

 (-2^{n-1})

- (26) a) Discuss 'Dimensional Analysis' as a tool in forced convection to evaluate convective heat transfer coefficient. [8]
 - b) A motor cycle cylinder consists of 10 fins, each 15 cm outside diameter and 7.5 cm inside diameter. Calculate the rate of beat dissipation from the cylinder fins when the motor cycle is muning at 60 km/hr. Use Nu = 0.036 (Re)^{1,3}, (Pr)^{0.0}. [8]

The atmospheric air is at 20°C & the average fin temperature is 480°C. The thermophysical properties at average temperature of 250°C are :

p = 0.674 kg/m³; Cp = 1038 J/kg.k, k = 0.0427 w/mk; Pr = 0.677; $\gamma = 40.61 \times 10^{+1} m^{3}/s$

The approximate value of heat transfer coefficient may be evaluated by considering the fine as a single horizontal flat plots of the same area. Take the characteristic length $[\psi] = (0.9 \times d)$.

(Q7) a) Derive an expression for effectiveness of parallel flow heat exchanger. [8]

-34

(b) The following data is given for counter flow host exchanger : [8] m₀ = 1.0 kg/s; m₁ = 0.25 kg/s; Cph = 1.045 kJ/kg, "C; Cpc = 4.18 kJ/kg, "C; Thi = 1000"C, Teo = 850"C; U = 88.5 w/m²."C

 $\& \Lambda = 10 \text{ m}^2$

Calculate 'Tho & 'Tei', Take e = 0.48.

(28) Write thur notes un (Any Tiscoe)

[18]

- Ilydrodynamie & thermal boundary layer.
- b) Reynold's analogy for luminar flow.
- Combined free & forced convoction.
- d) Typical pool beiling curve.
- Fouling factor.
- f) Modes of mass transfer.

S-2084 Total Net of Pages 1.3

T.E. (Mechanical Engineering) (Semester - V) (Revis	(heil
Examination, December - 2015	- 32
MANUFACTURING ENGINEERING (New)	
Sub. Code : 45565	53

Day and Date : Saturday, 12 - 12 - 2015. Time : 02.09 p.m. to 06.09 p.m.

Sent. No.

Total Marks : 146

Instructions 1) Question No. 1 and Question No. 5 are compulsory.

2) Solve two questions from remaining questions of each section.

3) Figures to the right indicate fell marks,

4) Assume suitable data wherever necessary and state it clearly.

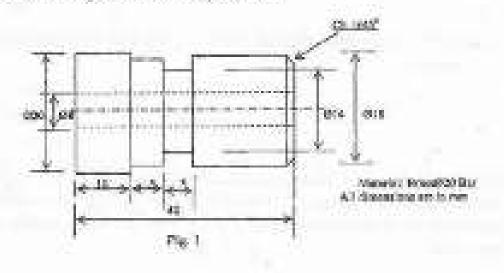
5) Use of usin programmable calculator is allowed.

SECTION - 1

- Q1) The component shown in Fig. 1 is to be processed on a single spindle automat. Study the component and prepare [18]
 - i) Detailed process sheet
 - ii) Tool Layout

(iii) Cam profile for drilling operation.

(v) Culculate production rate per hour.



1.00

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Q2) b) Derive an expression for shear angle. State clearly the assumptions made.

b) In an orthogonal cutting operation the followed data have been observed :

[8]

181

chip thickness t = 0.3 mm, Feed = 1.8 mm /rev

Width of cut b = 2.5 mm

Rake angle is = 10°

Catting force Fe = 1200 N

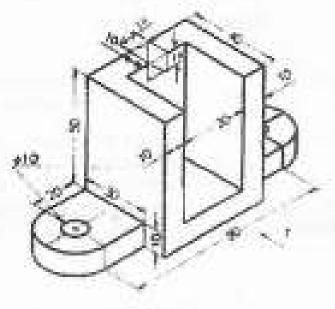
Feed force Ff = 300 N

Determine:

- Shear angle
- ii) Co-eff. Of friction at tool chip interface
- iii) Shear stress
- (Q3) x) Using Taylor's equation and using n = 0.5 and C = 400. Calculate the percentage increase in tool life when the cutting speed is reduced by 50%.
 [6]
 - b) Define machinability. What are the factors affecting machinability? Establish machinability based on [10]
 - Catting force
 Surface finish
- (24) a) Explain with next sketch the tool geometry of single point mating tool.
 [8]
 - b) Explain hear generation in metal cutting and significance of use of coolants.
 [8]

SECTION - II

Q5) Design and draw next dimensional drawing in three views with one sectional view of a jig for drilling two holes \$10 as shown in fig.II. Show clearly the datails of location, clamping and guiding elements. Assume this as a final operation. [26] Design and draw next dimensional drawing in three views with one sectional view of a milling fixture for milling the 10 ± 0.05 mm wide slot at the component shown in fig.II. Show the details of location, clamping and setting of cutter. Assume this as a final operation. [26]



-			n	
	-	80	ы	н.
	-		-	

Q61 N	Explain the importance	[6]	
1212000	i) Strippers	ii) Cleanator	53535
(6)	Explain with neat sket	ch progressive die.	[6]
		10 Boot	

Q71 +3	List the basic methods for replacement and selection of the	he torils and
	explain any one method.	[6]
1464		

b) Explain breakeven point method for selection of machine tools. [6]

Q8) Write short notes on any two.

- a) Methods of estimation.
- b) Advantages of using jig and fixtures.
- c) Diamond locater.
- 6) Strip layout.

密電車

-3-1

 $\{12\}$

S-2085 Total No. of Pages : 7

Total Marka : 100

T.E. (Mechanical) (Part - III) (Semester - V) Examination, December - 2015 MACHINE DESIGN - 1 Sub. Code : 45551

Hay and Date : Tuesday, 15 - 12 - 2015 Time : 02.30 p.m. to 05.30 p.m.

Instruction (1) Attempt any three questions from each section.

2) Figures to the right indicates full marks.

3) Draw sketches if required.

4) Assume suitable data & mention the muse clearly.

SECTION - I

Q1) a) Give general design procedure for a Machine component. [6]
 b) Recommend suitable material for following components with reasons. [6]

D Sergical Instruments

ii) Keys for Fastening.

iii) Helical spring

 c) Enlist different theories of Failure. Explain Maximum principal (Normal) stress theory.

(22) a) Explain design procedure of turn backle.
 (7) Design a right angled bell crank lever. The horizontal arm is 500 mm long and a load of 5 kN acts vertically downward at the end of this arm. A short arm is 100 mm on which force acts. The permissible stresses for lover and pin materials are 75 MPa intension and 60 MPa in shear. Safe bearing pressure is 10 N/mm². The lever has rectangular cross-section and ratio of width to thickness is 3:1. The pin length is 1.25 times pin diameter.

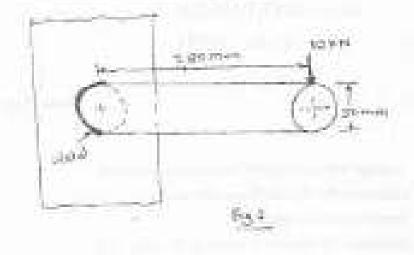
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S-2085

56E

- Q3) a) Explain design procedure of bolted joints subjected to eccentric load in shear. [8]
 - b) A 50 mm diameter solid shaft is welded to a flat plate as shown in Fig. 1. If size of the weld is 15 mm. Find the missimum normal and shear stress in Weld. Refer Sketch. [8]



- (24) a) Explain design procedure of rigid flange compling with next sketch. [9].
 - b) A steel spindle transmits 6 kw at 1200 spin. The angular deflection should not exceed 0.25° per meter of the spindle. If the modulus of tigidity for the material of spindle is 85 GPn. Find the diameter of the spindle and the shear stress induced in spindle. [7]

SECTION - II

- (25) a) Explain Wahl factor and it's use in spring design.
 - b) Safety value of 50 mm diameter is to blow off at pressure of 1.2 N/mm². It is held on sear by helical spring of spring index 5. Maximum lift of value is 5 mm. If maximum shear stress limited to 420 N/mm² and modules of rigidity 84 x 10⁹ N/mm². Design spring. [10]

Refer table for wire selection.

SWG	4/0	3/0	2/0	0	4
Wir: die nun	10,160	9.490	8.839	8.229	7.620

(2e)

S - 2085

- (26) a) Draw sketch of recirculating ball screw replain it's working met application. [6]
 - (b) A double start square threaded screw of 80 mm maniful diameter with 10 mm pitch, supports vertical load of 20 kN. Axial theres on screw is taken by collar bearing of 200 mm outer diameter and 150 mm inter diameter. [10]

Find force required at end of level which is 300 mm long to roise and lower load.

Coefficient of Iriction for screw is 0.15 and for collar 0.2,

- Q7) a) Explain coefficient of fluctuation of speed indicating various values of applications. [7]
 - b) The turning moment diagram of multicylinder engine is drawn with scale 1 mm = 4.5° on X axis and 1 mm = 70 N.m on Y axis. The intercepted areas between torque developed by argine and mean resisting torque of machine taken in order from me -35, +110, -285, +325, -335, +260, -365, +285, -260 mm². The engine is running at mean speed of 300 RPM. Coefficient of speed fluctuation is limited to 0.02. Rimmed flywheel is made from grey C.L. (FG 200) with mass density 7100 kg/m². Hub and spokes contributes 10% of required. Moment of inertia. The rim has rectangular cross section with width to thickness ratio 1.5. Fluid dimensions of rim. [10]
- (Q8) a) Give various steps to select flat belt from manufacturor's confogual [7].
 - (b) Select V belt to connect 15 kw@ 1500 RPM to compressor running in 500 RPM centre to centre distance between shafts is approximatly Lin. Machine is running at 10 Hes/day. [10]

Select belt specifications, number of helts, cornect centre distance and policy diameters.

S-2085

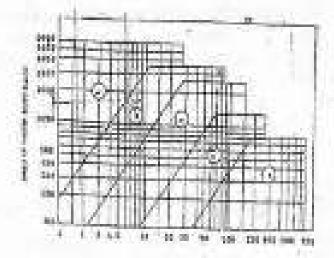
Birin Rep. 0, No. 801

Power rating of V-bellet

(a. = 197's special of the lacks palley - 1983 r.p.m.)

(U = juiley diameter (mm) ; \mathcal{H} = \mathcal{P}_{0} sectoring in $\mathcal{K}W)$

Station	ø	5. 19	85	51	105	105	112	811	125
- 14	39.	0.13 0.38	039	1.02	1.38	1.93	1.6	18.	2.00
Section	5	125 330	340	19	180	100	160	199.	200
з	<u>.</u>	128 1.46	ŝŭ.	1,50	568	6.00	4.34	677	5.23
herm	Ð	200 213	1234	175.	150	282	\$10	160	11.5
ţ,	F1	6.51 1.81	7.18	8.22	145	10.93	11.59	12-16	12.50
Sector	D	No mi	-00	815		Π,	-		
U.	13.	157 .67.5	19.3	39.68		_			



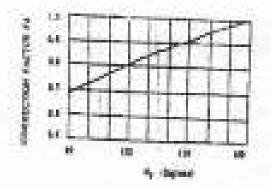
Dolgs power (1941

Selection of cross section of V-halt

 S_{-2085}

Correction factor $\langle F_{ij}\rangle$ for industrial tervice

	Operational lowest per day				
Type of service	9-10	10-16	16.24		
 Light doty; agitatore blowers-certrifagal paraga from (up to 7.5 kW) and conference 	n 14	1.2	13		
 Medium skip: convejors-fass (above 7.5 k line shafts machine tools-presses and post displacement pumps. 		1.3	14		
 Heasy daty; conveyors buckst elevators a humans 	nd 6.5	14	13		
		1	-		



Conversion factor for use of contact (V-grooses on both pulleys)

For Y bets

Sintes of professed values for pitch dispeters (in mm) are as follows:

Pitch	dame	ies (nus	i) : 125	132	140	155	160	170	185	190
200	212	224	236	250	265	289	300	315	325	375
400	415	451	475	300	230	260	609	030	670	710
750	450	900	1000	1453		-	_	1		-

15-

5-2085

2.4

Belt Saction	Walfs Witsen)	Thicksets Filterti	Ministen pitch diameter of pulley (and
Δ.	13	\$	125
E	12	11	200
C:	32	14	300
D	- 32	19	500
E	38	23	630
Co	evenice, of its	ate length to pi	ich length of the belt
Belt Section		A E	CDE
Difference bets and inside long		gth 36 4	5 56 70 92

Dimensions of wagshird cross-sections

33

-6-

S-2085

Correction fector Frifer bell langth

 $|\mathcal{L}_d = \operatorname{nonzioni}$ inside length of its belt in mm)

10.5	Belt section							
4 -	A	в	C	D	E			
1905	1.02	0.97	9.87	-	-			
1981	1.03	0.98		-	- 2			
2092	1.04		100	- 27				
2057	1.04	0.95	0.89	1.002	1.1			
2159	1.05	0.99	0.99		12			
2286	1.06	1.00	0.91		- 2			
2438	1,08	-	0.92	-	- 3			
2464	4	1.02	-	-	-			
2540	1.4	1.03		-				
2567	1,10	1.04	0.94	1.4				
2845	1.11	1.05	0.95	-	-			
3048	1.13	1.07	0.97	9.86				
3150	1	1943 (M	0.97	1.00				
3254	1.14	1,08	0.96	6.87	-			
3404		S. Billion	0.99					
3651	-	1.11	1.99	0.90				
4033	-	3,23	1.02	0.92	1			
4115	-	1.14	1.03	0.92	-			
4394	1.00	\$115	1.04	0.95	$\sim 10^{-10}$			
4572	-	1.16	1.05	0,94				
4853	2	1.18	1.07	0.96				
5334	1.00	1.19	1.08	0.96	0.94			
6945	-	- 10	1.11	1.00	0.96			
680T	-	12	5,24	1.071	0.99			
7569			1.16	1.05	1.00			

**

S - 2505 Tetal No. of Pages + 3

Tettal Marks : 160

[63]

See: No.

T.E. (Mechanical) (Semester - V) (Revised) Examination, December - 2015

CONTROL ENGINEERING

Sub. Code : 66241

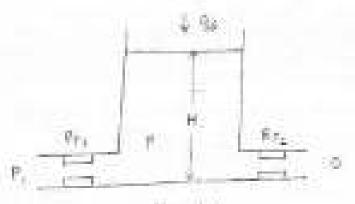
Day and Date : Tuesday, 08 - 12 - 2015 Tiree : 02.30 p.m. to 05.30 p.m.

fastructions : 1) All questions are compulsors.

2) Assense any additional data if required and incretion it clearly.

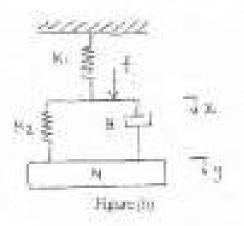
3) Figures to right indicates full numba

Q1/ a) For the tank shown in figure Ia, flow is supplied at rate Qs. Determine the equation for the pressure P (Head H = P(p)) as a function of P1 and Qs.





 b) For the mechanical system above in figure 1b, construct provided chair representation and obtain equation relating f and x. [6]

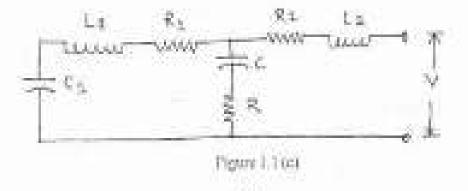


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S = 2505

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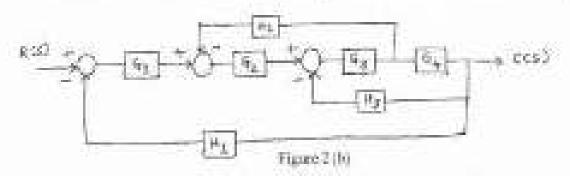
 a) For the electrical network shown in figure 1.1e construct mechanical system using inverse analog.
 [6]



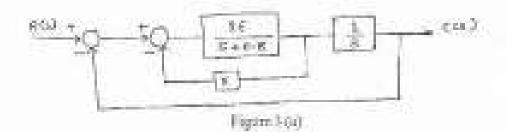
OR

Obtain mathematical model for gene train.

- Q2) a) The equation for the area of the parallelogram is A = WL.sin0. Determine the linear approximation for the area A. For Wi = 12, Li = 8 and 6! = 60°, what is the approximate area of A when W = 14, L = 9 and 0 = 58°. [8]
 - b Reduce the block diagram shown in figure 2b and find transfer function.[8]



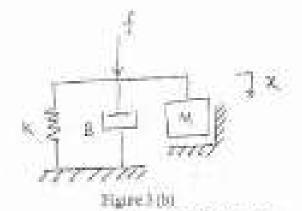
Q3) a) For the system shown in figure 3a, downnine the value of K such that the damping ratio is 0.5. Then obtain rise time, peak time, maximum overshoot and setting time. [8]



S = 2505

181

b) For the spring, mass, dumper system shown in figure 5b, obtain response when a (0) = 0, x(0) = 1, f = 0, M = 1, B − 3 and K − 2. [8].



- Q4) a) For the function $G(S) H(S) = \frac{66(3+63+223)}{(S+3)(S+3)}$ construct root locus with all relevant details. [12]
 - b) The characteristics equation of feedback control system is S⁴ + 20S⁶ + 15S² + 2S - K = 0, determine the range of K for the system to be stable.
 [6]
- Q5) a) Draw Bode plot for the transfer function

. 50

 $G(S) H(S) = \frac{1}{S(S + 0.25S)(1 + 0.1S)}$. From the graph determine, [8]

- Chin margin
- i) Phase margin
- b) Write a short not un Polar plot.
- Q6) a) For the differential equation (D + 3) (D + 4) y(t) = (D + 6) f(t), construct computer diagram and state space representation using direct programming. [8]
 - b) Construct computer diagram and state space representation using general programming for system represented by differential equation (D + 2) (D + 5) y(t) = (D² + 3D + 10) f(t).



3.

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T.E. (Mechanical) (Semester - V) Examination, December - 2015 CONTROL ENGINEERING (Pre Revised)

Sub. Code: 48709

Day and Date (Thursday, 17 - 12 - 2015

Total Marks : 100

Time : 02.38 p.m. to 05.30 p.m.

Instructions:

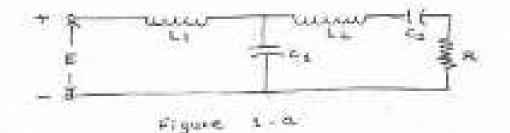
Attempt my three questions from section - Land section - II.

2) Assume any additional data if required and montion it clearly.

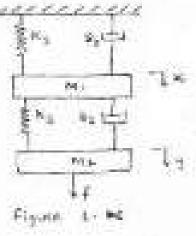
30 Figures to the right indicates full marks.

SECTION-1

 Q(1) a) Construct mechanical system using force voltage analog for the electrical network shown in figure Ia.
 [6]

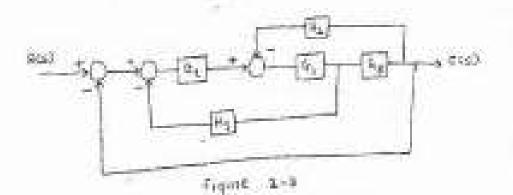


- b) Explain torsional system with neat sketch and write equation between torque and angular displacement. [6]
- Draw frait body diagram and write the differential equations of the system shown in figure 1c.

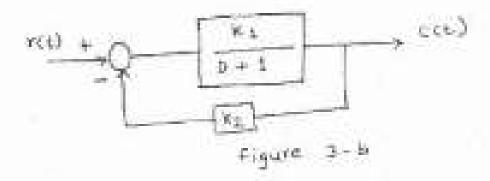


P.T.O.

- (Q2) a) Linearise the equation $\nabla = \frac{D}{T}$, where ∇ is velocity, D is displacement and T is time. Determine the linear approximation for v due to change in d and change in t. [8]
 - b) Reduce the block diagram shown in figure 2 b and find transfer function. [8]



- (23) a) A controller is to be designed for a system such that the output c will not change by more that 1 unit when the load changes by 10 units. The steady state operating curves for the system to be controlled have a slope of 5 units. What is the required slope of the controller lines when B = -0.3 [8]
 - b) For the system shown in figure 3 b, determine K, and K₂ so that the system will have a steady state gain of 1 and a time constant of 0.5 acc. [8]

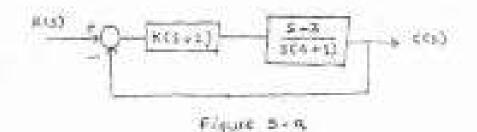


- (24) a)
 With next sketch, explain the operation of hydraulic survementer and determine the overall block diagram representation.
 [8]
 - b) Derive transfer function relation for AC and DC tachameters. [8]

b.

SECTION - II

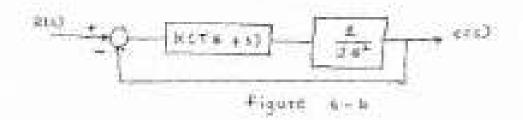
(25) a) The block diagram of a unity feedback control system is shown in figure 5 a. Draw the root locus diagram for the control system. [12]



 b) The chiractoristics equation for certain system is (s⁴ + 4S¹ + 3S + K) = 0. Determine the value of K for marginal stability. Also find the frequency value above which system becomes unstable.

Q69 a) Obtain unit step response of a unity feedback system having an open loop transfer function $G(S) = \frac{4}{5(S+3)}$. Consider all initial conditions as zero. [8]

 For the system shown in figure 6 b, determine damping ratio and natural frequency, if the time constant T is 3 see and ratio of torque to inertia (K/J) is 2/9 rad/sec².



 Q7) a) For the series RLC circuit shown in figure 7 a, determine the equation for damping ratio and natural frequency.
 [8]

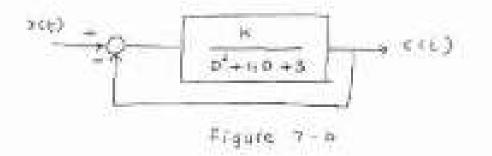


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S - 2506

181 J

 b) Determine response c(t) of the system shown in figure 7 b, when K = 1, (t) = 2e^{-b} and C(0) = C(0) = 0



(28) a) A system is described by the differential equation.

 $\frac{d^2 y}{dt^2} + \frac{6d^2 y}{dt^2} + \frac{11dt^2}{dt} + 10y = 3.$ u(i) where y is the output and u is the input to the system. Obtain the state space representation and draw computer diagram using direct programming.

b) The system equations are given by $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t) & u(t) = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ Find transfer function. [8]

8 - 2607

Total No. of Pages 13.

Section No.

T.E. (Mechanical Engineering) (Semester - V) (Revised) Examination. December - 2015 THEORY OF MACHINES - H

Sub. Code : 66242

Day and Date : Thursday, 10 - 12 - 2015 Time : 02.30 p.m. to 05.36 p.m.

Instructions: 111

- All questions are compulsory. 2kFigures to the right indicute full marks.
- 387
- Draw next inheled shetch wherever nocessary.
- 46 Assume if necessary suitable thru and state clearly,
- 51 Use of non-programmable calculator is permitted,
- Derive the expression for the length of path of contact with us and notations [8] OB(4)

OR

Derive an expression for minimum number of teeth required on pinion to avoid interference in mesh with year.

- A pair of 20" full depth involute spor gears having 30 and 50 teeth biri. respectively of module 4 mm are in mesh. The smaller gest matter at 1000mm Determine 10401
 - length of path of operate. n
 - 83 contact ratio.
- Explain the torques in epicyclic gear train, O21.n1

OR

Write a pore on Inertin geared system-

(b) An apleyellic gear train provises of three wheels A, B and C as shown in. fig. 2b. Wheel A has 72 internal teeth. C has 32 external teeth. The wheel B gears with both A and C and is carried on an ante-which matter about the centre of A at 18 rpm, If the wheel A is fixed, determine the record of wheels B and C. 1102



Fig. Post 24:

P.T.O.

101

Total Marks (100)

1.1

S - 2507 Yotal No. of Pages : 3

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Accession of	 _	_	- 10

T.E. (Mechanical Engineering) (Semester - V) (Revised) Examination, December - 2015 THEORY OF MACHINES - II

Sub. Code : 66242

Day and Date : Thursday, 10 - 12 - 2015 Time : 02.36 p.m. to 45.30 p.m. Total Marks : 100

- Inductions: 1) All questions are compulsory.
 - 2) Figures to the right indicate bull marks.
 - Dyony must habeful skotich whoreyour minerary.
 - 4) Assume if necessary suitable data and state clearly.
 - 5) Use of non-programmable colculator is permitted.
- (22) a) Derive the expression for the length of path of contact with unual notations [8] (3R)

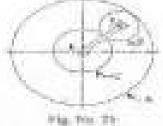
Derive on expression for minimum number of teeth required on pinion to avoid interference in meth with gear.

- b) A pair of 20° full depth involute spur gears having 30 and 50 teeth respectively of module 4 mm are in mesh. The smaller gear rotates at 1000pm. Determine [10]
 - length of path of contact,
 - ii) comact ratio
- (02) ii) Explain the tocques in epocyclic goar train.

OR .

Write a note on Inretia grand system.

(b) An epicycile gear train consists of three wheels A, B and C as shown in Fig. 3b. Wheel A hos 72 internal teeth, C has 32 external teeth. The wheel B grups with both A and C and is intried on an one which rotates shout the centre of A at 18 pm. If the teleal A is fixed, datarming the openi of wheels B and C. [10]





S = 2507

Q37 a) Derive the expression for gyroscopic couple magnitude.

[6]

b) A melog our weight 20kN. It has a wheel base of 2 m, track width 1m and height of C.G is 0.30 m above the ground level and lies midway between the front and rear axis. The origine flywheel rotates at 3000 cpm clockwise when viewed from the front. The moment of inertia of the flywheel is 4 kg-m² and moment of inertia of each when its 3kg-m². Find the reactions between the whoels and the ground when the car takes a curve of 15m radius towards right at 30km/hr, taking into consideration the gyroteople and centrifugal effects. Each wheel radius is 0.40m [10].

(240 ii) Derive an expression for vehicity and acceleration of the silder of slider erank mechanism. [6]

OR:

Explain dynamically equivalent system to replace connecting rol by a two mass system.

- b) The connecting read of a variable reciprocesting angine is 2 m long between contrast and weights 250 kg. The mass contrast is 500 mm from the Sig end bearing. When suspended as a producture from the godgeon pin mils, it makes 8 complete oscillations in 22 seconds. Calculate the radius of the gyration of the red about an axis through its mass centre. The enack is 400 mm long and rotates at 200 rpm. Find the inertia torque exerted on the consideration when the crank bas turned through 40° from the top dual centre and the gisten is moving downwards. [10]
- (Q5) a) Explain direct and reverse counk method for balancing of the radial engine. [6]

OR.

Explain partial balancing of anhalanced primary force in a reciprocasing edgine.

b) Four misses A, B, C, and D as shown below are to be completely balanced. [12]

	- A -	В	C	D
Mass (kg)	-	30 .	- 50	40
Radius (mm)	185	240	120	1,50

-2-

1.0

[6]

The planes containing masses B and C are 300 mm apart. The angle between planes containing B and C is 90°, B and C make angles of 210° and 120° respectively with D in the same setse.

Find:

- The magnitude and the angular position of rouss A, and
- The positions of planes A and D.

(06) (a) Derive expression for energy stored in a flywheel.

b) The huming moment diagram for a multi-cylinder engine has been drawn to a scale of 1 mm in 500 N-m torque and 1 mm to d⁺ of crank displacement. The intercepted areas between output torque curve and mean resistance floe taken in order from one and in sg. mm are -

-30, + 410, + 280, + 320, - 330, + 250, - 360, + 280, - 260 sq.mm, when the engine is running at 800 rpm. The engine has a strake of 300 mm and the fluctuation of the speed is not to exceed 2.14 of the mean speed. Determine the suitable dimmeter and cross-section of the rim flywheel rim for a limiting value of the safe centrifugal stress of 7 MPa. The material domain may be assumed as 7200 kg/m³. The width of the rim is to be 5 times the thickness. [10]

000

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Total No. of Pages : 7

Seat 31132

T.E. (Mechanical) (Part - III) (Semester - V) (Revised) Examination, December - 2015

MACHINE DESIGN - 1

Sub, Code : 66244

Day and Date : Tuesday, 15 - 12 - 2015

Total Marks (100

Time : 02.30 p.m. to 05.30 p.m.

Instructions 1) All questions are compulsory.

2) Figures to the right indicote full marks.

3) Make suitable assumptions wherever required and state three clearly.

4) Use of non-programmable calculator is permitted.

5) Draw acat diagrams wherever necessary.

Q1) Solve my Three 1.

a) How material is selected while designing a machine element?

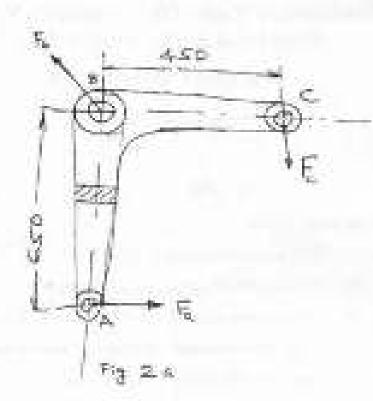
(i) State different theories of failure. Define any three-

- c) Explain the design procedure for a tant backle with the help of next sketch.
- Explain the design procedure of builted joint subjected to eccentric local in place containing boils.

P.T.O

S = 2508

(Q2) a) Figure 2a shows a hell-crank lover, used to drive the air pump of a condenset. A force of 5km acts at A as shown. Determiniz [8]



i) The forces at the fulcrum, B and at C

ii) The diameter of pios at A,B and C(Assume that the ends A and C are forked and the pin at B is overhoug).

iii) The cross section of the lever near the fislerum.

Lise the following stress values for both the lever and pin material.

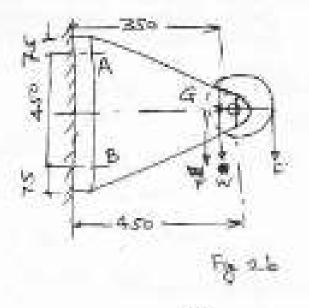
Permissible stress in tension = 80MPa

Permissible stress in shear - 45MPa

Permissible bearing pressure = 10MPa

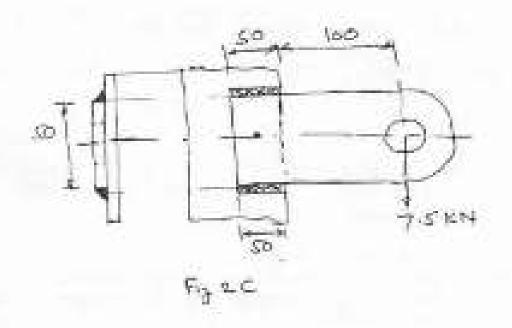
S - 2508

b) Figure 2b shows a pulley bracket, which is supported by 4 bolts, 2 at end A and 2 at end B. The weight of pulley and bracket, W is \$50%, and the load, F on the rope is 20kN. Determine the size of the bolts, using an allowable shear stress of 40 MPa for the bult material. [8].



40 E	14	н.	in.	
τ.	а.	b.	n	
	e		ne.	

b) A welded connection as shown in figure 2c is subjected to the eccentric torce of 7.5kN. Determine the size of welds if the permissible shear stress for the weld is 100N/mm². Assume static conditions.



8 - 2508

- (23) a) What are the different types of coupling? Discuss the design procedure for mult coupling. [6]
 - [b] A splined connection with the following particulars is used for a gear and shaft assembly in a gear box. The power to be transmitted in 20 kW at 240 i.p.m. The bearing pressure on the splines is limited to 6.SMPa during sliding. The coefficient of friction is 0.12 [10]

Major diameter = 60mm

Minor diameter = 54mm

Number of splings = 10

Determine :

i) The length of gear hab.

ii) The force required to shift the semi-

OR

b) A protective finage coupling is used to connect two shafts and transmits 7.5 kW of power at 720 r.p.m. The design targue is 150% of rated torque. The shafts and bolts are made of plain earbon seel 3008

 $\langle S_{ii} = 400$ N/mm², factor of safety = 5.00).

Assume $S_{g_{\rm e}}=1.5S_{g_{\rm e}}$ and $S_{g_{\rm e}}=0.5S_{g_{\rm e}}$. The flanges are made of cast iton,

Calculate

Diameter of shafts -

ii) Number of belts

ini) Diameter of the bolts.

Draw proportionate sketch of the flange indicining dimensions with their proportions.

- (24) a) What are the various types of springs used in practice? Explain one upplication of each. [6]
 - b) Safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/mm². It is held on its seat by closed coil belical spring. The maximum lift of valve is 10 mm. Design a suitable compression spring of spring index 5 and providing an initial compression of 35 mm. The maximum shear stress in the material of wire is limited to 500 N/mm². The modulus of rigidity for spring material is 80 kN/mm². Calculate 1 [10]

i) Diameter of spring work

ii) Mean coil diameter.

iii) Number of active turns and

iv) Pitch of the coil

Assume Whal's Stress factor $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$

Standard wire gauge (SWG) number and corresponding diameter of soving wire is given in the following table.

SWG	4/0	5/0	640	770
Diameter (mm)	10.160	10.973	11,785	12,70

(25) a) What do you understand by overhouling and self looking of power screw? Hence deduce the condition for self looking screw. [6]

OR .

Discuss various forms of threads used for power transmission giving their relative merits and limitations.

8 - 2508

b) The power transmission screw of a screw press is required to transmit maximum loud of 100 kN and countes at 60 RPM. The trapezoidal threads are to be used as under: [12]

Nominal Dis. muy	40	50	60	70
Core Dia.mm	32.50	41.50	50,50	\$9.50
Mean Dia. mm	36,50	46.00	55.50	65.00
Core Area mm?	830	1353	2003	2781
Pitch mm	7	8:	. 25	10

The screw thread friction coefficient is 0.12. The tonque required for collar friction and journal bearing is about 10% of the tonque to drive the load considering screw friction. Dotomaine screw dimensions and its efficiency. Also determine the motor power required to drive the screw. The maximum permissible compressive stress in the screw is 100 MPa.

- (Q6) a) Explain the step by step procedure for selection of V-bell from Manufacturer's Catalogue. [6]
 - b) It is required to solect flat belt drive for a fan renaing at 360 gan which is driven by a 10 EW 1440 gpm motor. The belt drive is open type and space is available for a center distance of 2 m approximately. The belt should operate at velocity between 17.80 m/s to 22.90 m/s. The power transmitting expacitly of the belt per mm width per ply at 1887 are of contact and at a belt velocity of 5.08 m/s is 0.0118 kW. The load correction factor can be taken as 1.2. Suggest preferred pulley diameters for the motor and fan pulleys and give complete specifications of belting. Refer the tables given below. [10]

-6-

S - 2508

Are of Contact Factor (Fg)

$\alpha_{\rm e}~({\rm Deg})$	130	140	1,56	160	170	180	190	200
£.	1.25	1,19	1.13	1.08	1.04	1.00	0.97	0,94

Standard Widths of these lights in man-

3-Ply	-25	40	-\$0	63	76					
+-Phy	-40	44	20	63	76	96	100	112	125	152
5-Pty								1		
6 Ply	332	125	152	180	200					

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S = 2600 Total No. of Pages : 3

Total Marks : 100

[6] I

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T. E. (Mech.) (Part - III) (Semester - V) Examination, December - 2015

HEAT AND MASS TRANSFER

Sub. Code : 66243

Day and Date : Saturday, 12 - 12 - 2015

Time : 02.30 p.m. to 05.30 p.m.

Testractice:

- 1) All Questions are compaisory.
- Figure to the right indicates full marks.
- Assume suitable data wherever necessary and state it clearly.
- 4) Use of scientific calculators is permitted.

QI) a) Write the basic laws of Heat Transfer.

- b) Write the general hast conduction equation in Corresian, Cylindrical and Spherical coordinates, [4]
- c) An Exterior wall of a house consists of a 10.16 cm layer of common brick having thermal conductivity 0.7 W/mK. It is followed by 3.8 cm layer of gypsum plaster with thermal conductivity 0.48 W/mK. What thickness of locsely packed Rockwool insulation (k = 0.063 W/mK) should be added to reduce the heat transfer through the wall by 80%[7]8]

(OZ) (b)

Solve any one of the following.

- From the general heat conduction equation in cylindrical occedinate system, and deduce the equation in one dimensional Poison's equation and derive the equation for temperature distribution and heat transfer for a solid cylinder.
- ii) Write the general best conduction equation in Cartesian, cylindeleal and spherical coordinate system, also deduce the equation in one dimensional Poison's equation and derive the equation for temperature distribution and heat transfer for a slab.

S - 2600

- b) A plane wall (k = 45 W/mK). 10 cm thick generates hest at a uniform rate o(8 × 10⁶ W/m³. The two sides of the wall are maintained at 180°C and 120°C, calculate (j) Temperature distribution across the plane wall, and (ii) location and magnitude of the highest temperature in the wall. [8]
- (23) a) Solve any one of the following.
 - i) What are the initial and boundary conditions? What are their types? Explain with mitable examples.
 - Define fin efficiency and effectiveness, derive the equation for fin efficiency for a fin with insoloted tip.
 - b) The steam at 300°C is passing through a steel tube. A thermometer pocket of steel (k = 45 W/mK) of diameter 16 mm and 1 mm thick is used to measure the temperature. Calculate the length of the thermometer pocket needed to measure the temperature within 1.8% permissible error. Take heat transfer coefficient 90 W/m²K, and tube wall temperature as 100°C. 181
- Q4) a) Explain phenomenon Natural convection and Forced convection. [4]
 - b) Explain thermal boundary layer with the help of next sectch. [4].
 - c) A water is heated while flowing through 1.5 cm = 3.5 cm rectangular cross section tube at velocity of 1.2 m/s, the inlet temperature of water 40°C. And the tube wall is maintained at 85°C. Determine the beat transfer coefficient, take properties of water at bulk mean temperature as Density = 985.5 kg/m³, k = 0.854 W/mK, C_g = 4.18 kJ/kgK, Kinematic Viscosity=0.5 17 = 10^{-m}m³/s, Pr = 3.26 Åssume Nu = 0.025 Re^{3/P}P⁻¹[8]

(25) a) Explain the terms i) Radiosity ii) Irradiation.

 b) Derive expression of shape factor for cylindrical cavity with diameter D and height H.
 [6]

OR:

- b) Derive Stefan Boltzman law from Planck's law
- c) Assuming out to be black body having surface temperature of \$800 k. Calculate i) Total emissive power ii) Wavelength at which monochromatic emissive power is maximum iii) Maximum value of monochromatic emissive power [8]

1.6

(8)日

[4]

- (26) a) Explain dropwise and filmwise condensation with treat sketch. [4]
 - b) What do you mean by faciling factor? What are the causes of failing?[4].

S = 2600

c) A counter flow heat exchanger is employed to heat air entering at 400°C with a flow rate of 6 kg/s by exhaust gas entering at 800°C with a flow rate of 4 kg/s. The oversil heat transfer coefficient is 100 W/m²K and the outlet temperature of air is 551.5°C. The specific heat at constant pressure for both air and exhaust gas can be taken as 1100 J/kg/K. Calculate; i) Heat transfer area needed ii) Number of transfer units. [8]

OR.

Water at 225 kg/h is to be heated from 35°C to 95°C by means of oncentric tube heat exchanger. Of at 225 kg/h and 210°C with a specific heat of 2093 J/kgK is to be used as not fluid. If the overall heat transfer coefficient based on outer diameter of inner tabe is 550 W/ts/K. Determine the length of heat exchanger, if the outer diameter is 100mm. [8]



S = 2606 Total No. of Pages 13

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T.E. (Mechanical) (Part - I) (Semester - V) Examination,

December - 2015

METROLOGY AND QUALITY CONTROL

Sub. Code : 45564

Day and Date: Securday, 19-12-2015.

Time : 02.30 p.m. to 05.30 p.m.

Total Marks : 103

Instructions: 1) Answer any three questions from each section,

- 2) Figures to the right indicate full marks.
- 3) Draw near labeled sketches wherever necessary.
- 4) Assume if necessary suitable data and state there clearly.
- 5) Use of non-programmable calculators is allowed.

SECTION - 1

$\mathcal{Q}D a\rangle$	Describe the various sources of errors in measurement. [6]
b)	Explain Taylor's principle of gauge design [6]
4)	Enumerator the advantages of wavelength standards, [4]
(22) a)	Drow a near sketch of Sigma comparator and explain its working. [8]
b)	State the precautions to be taken while using slip gauges [8]
Q3) ii)	Explain the geinciple of measurement by light wave interforence. (8)
b)	Explain the use of usechanical bevel protractor in angle measurement [8]
20 We	its short notes on (any three). [18]
- 43	Abbe's principle of alignment
- 60	Ship gaoges
(4)	Spirit level
(d)	Anele Dekkar

a) Level beam comparator

ETO

S = 2606

SECTION - II

- Q59 a) What are the different methods for the measurement of effective diameter of screw thread. [8]
 - b) Explain with figure the working and use of gour tooth vernier caliper. [8]
- (26) a) Differentiase between quality control and quality assurance. [8]
 - Explain the concept of balance between cost of quality and value of quality. [8]

Q2) a) Discuss chance causes and assignable causes of variation. [6].

 b) Following data was obtained for diameter of a component from shop floor. Construct X-bar and R charts and state whether the process is in control or not. [10]

Sample No.	- X.	N ₁	X,	X,	X_{t}
1	43	61	64	60	72
2	46	54	67	71	79
3	18	23	74	.76	-81
4	37	49	56	67	70
5	41	44	64	713	74
6	23	24	23	45	51
7	56	61	61	62	84
8	25	38	40	46	.71
9	24	34	46	-51	66
10	33	3.8	40	49	58

For sample size = 5 take A₂ = 0.577, D₄ = 2.114, D₅ = 0.

Q8) Write short notes on (may three).

- a) CLA method for measurement of surface roughness
- b) Different errors in screw threads
- c) Measuring of composite errors in gears

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- d) Operating characteristic curve
- e) Single and double assopling plan

XX

S = 2692

Total No. of Pages : 3

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T.E. Mechanical (Semester - V) (Revised) Examination, December - 2015 MANUFACTURING ENGINEERING

Sub. Code : 66245

Day and Date : Thursday, 17 - 12 - 2015 Time : 1.30 p.m. to 05.30 p.m. Total Marks :100

Instructions: 1) All questions are compulsory.

- 2) Figures to right indicate full marks,
 - 3) Assume if necessary suitable data and state them clearly.
 - 4) Use of non-programmable calculators is permissible.

Q1) Solve any two

- Explain different types of tool materials. List important properties of tool materials. [8]
- b) Explain orthogonal and oblique cutting operation with near sketch.[8]
- c) During orthogonal turning operation of C40 steel with carbide curing tool, following observations were made. Curing force =3000N, Feed force = 2000N, Rake angle = 10°, chip thickness ratio= 0.35. Find out Shear plane angle. Confficient of friction between chip and tool interface and friction angle. [8]

(Q2) Solve may two.

- Explain concept of heat generation in metal cutting and use of coolants.[8]
- b) Draw neat sketch of a single point cutting tool and explain different ingles provided on single point cutting tool. [8]
- c) While machining C40 steel with HSS tool at a feed rate of 0.2 mm/oev, and 2 mm depth of cat, following observations were acted.

Cutting speed (m/min):	2.5	35
Tool life (hours):	1.5	0.333

Assuming Taylor's equation as V.'T" = constant, recommend the catting speed for tool life of 1 heur. [8]

P.T.O.

S - 2692

(Q3) The component shown in fig. 1 is to be processed on a single spindle interest. Study the component and preprint. [18]



- Fig. 1 : Material M. S. pollsh bar #25.
- Detailed process sheet.
- b) Tool layeat
- c) Cam profile for druling operation

Q4). Solve any one

a) Design and draw seat dimensional drawing in three views with one sectional view of a jig for drilling two holes φ20 as shown in figure 4a. Show clearly the details of location, clamping and gasding elements. Assume this us a fisal operation. [26]

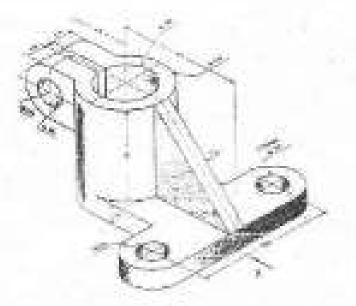
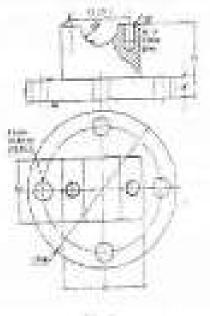


Fig.4a

2.1

5-2692

b) Design and draw a near dimensional sketch in three views with our sectional view of a milling fixture, for milling the surface marked (v) as shown in figure. Show clearly details of location, champing of work piece and guiding of center. Assume this as a final operation. [26]





(25)	Sid	ve any two	[12]
	n) -	Explain with neut sketch nomenolatory of pross tool.	[6]
	b)	A waster with a 12.7 mm internal hole and outside diameter num is to be made from 1.5 mm thick strip of 0.2 % carbo Considering the elastic recovery of material, find: 1) The ele 2) Piercing punch size and, 3)Piercing die opening size.	a steel.
	Ø.	Write design considerations for the element.	[6]

[]]]

(26) Write Short noses on any threat

- a) Construction and working of CNC
- b) Automatic tool changers
- d) Modular Tooling systems
- d) Comparison between NC and CNC Machines

SC - 76 Tittal No. of Pages 13

T.E. (Mech.) (Semester - V) Examination, November - 2619 CONTROL ENGINEERING Sub. Code : 66241

Day and Date : Friday, 22 - 11 - 2019 Time - 2.30 p.m. to 5.38 p.m.

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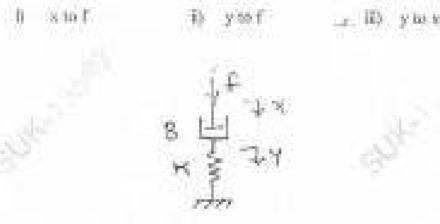
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Total Marks (100

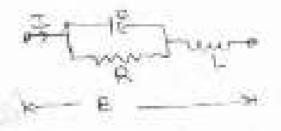
Instructions: 1) All the questions are compulsary. 2) Assume solitable data wherever required and mention it clearly.

a) south search and merson require and merson e arange

Q1) a) For medianical system shown in fig. Below, determine the eq: which relates [6]



 For the electrical system shown in fig. below, construct mechanical system which is in direct analog
 [6]



Write electrical analogy for fluid systems and explain in detail.

ETO

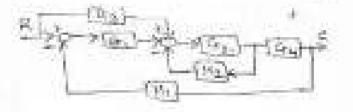
[8]

1121

Q2) a) Effect a linear approximation for $T = 2\pi \sqrt{\frac{L}{C}}$. For Li = 100 and Gi = 32.2,

desension the change in the period due to an increase in 2 of 1 and decretse in G of 0.1 [8]

b) Reduce the block diagram and find the transfer function.



Q3) a) The forcing function is n(t) = u(t) and all initial conditions are zero. Determine the response u(t) of system [8].



b) Enc control system shown in fig. Determine K₂, K₂ and 'a' such that system will have a steady state gain of 1, a natural directionary of '2' and damping ratio of 0.5. (8)

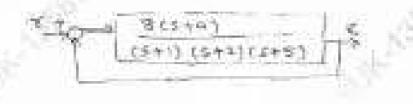


Q40 a) Construct root locue plot fur



 (2^{-1})

b) Determine value of "a" such that system is stable



(Q5) a) Sketch the Bode plot for the transfer function

$$G(S) = \frac{1000}{S(1+0.1S)(1+0.001S)}$$

Determine gate margin and phase margin.

1101

i 61

151

 b) Find the break is point and angle of departure for the control system given by characteristic equation

¥.

$$1 + \frac{K(S+1)}{S^2 + 4S + 13} = 0$$

Q6) a) Determine state space representation & computer disgram using saries method.

$$\gamma(t) = \frac{D+3}{D(D^2+8D+20)} f(t)$$
[8]

b) Determine state space model and computer singsum using general method



SC-79 Totel Nu. of Projes 13

T.E. (Mechanical Engineering) (Part - III) (Semester - V) Examination, November - 2019 THEORY OF MACHINES - II Sub. Code : 66242

Day and Date : Monday, 25 - 11 - 2019 Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 169

Instructions :

See No.

- All questions are compalines:
- 3) Figures to the right indicate in Reactor.
- 3) Make suitable ascuraptions wherever sequired and state these clearly.
- 4) Use of non-programmable enlessings is permitted.
- 55 Draw near diagrams wherever accessary.
- Q(1) a) Derive the expression for the minimum number of teeth required on pinion to avoid interference in mesh with gear.

OR -

Prove that velocity of sliding is proportional to the distance of the point extract from the pith point. [8]

- b) A 20° Involuse gear of 8 mm module with 50 seeth is driven by a pirion of 20 seeth. If the contact ratio is to be maximum without interference, fluid the oddendum of pinion, gear, length of path of contact and contact ratio. [10]
- Q2) al An epicyclic gear train consists of mit, planet, arm and armular gear. Derive the equation of velocity ratio.

OR.

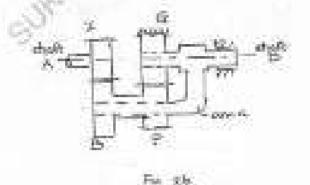
A general system consists of three genes A, B, C with T_A , T_g , and Te tooth Forming's simple gene train. Derive the equation of inertia longue applied at driving gene. [6]

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SC-79

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b) An epicyclic gene train is shown in fig 2b. The arm 'a' rotates at 200 t.p.m. The gene 'P' with 20 teeth and gene 'B' with 40 teeth are compounded and rotate freely on the pin carried on the arm. The gene 'I' (30 teeth) is attached to the shaft. Find the speed of the shaft carrying gene', I' and its relative direction to the arm. [10]



Q3) a) Explain with sketch the following as related to gyroscope.

a Axis of Spin

i) Actis of Procession,

- in Active couple and
- by Reserve couple
- b) The surface rotor of a ship has mass moment of inertia of 324 kg m² it rotates at 1800 rpm when looking from steen. [10]
 - Determine the gyroscopic couple and its direction when the ship is traveling at 40 km/hr and stears to the left in a curve of 100 m redius.
 - if a maximum gyrescopic couple of 8000 Nm is permitted, what is the limiting speed of the rotor? Assume the speed of ship is propertienal to rotor speed.
- Q4) a) With new skytch, explain various dynamic forces acting in recipropring engine merilsuhism. [40]

OR

Explain Triffing suspension system for determining M.I. of rigid body [6]

The following data relate to a horizontal reciprocoting engine-510

Mass of reciprocesting parts = 120 kg. Crask Length = 90 mm. Engine speed = 400. Mass of consecting rod = 90 kg. Length between denters of connecting rod = 450 mm. Distance of center of mass from bir end custor = 180 mm, Radius of gynation about axis through center of many =150 mm

Find the magnitude and direction of the marrie torque on the crack shaft. when the crank has tunned through 30° from the inner dead conter. (100

Explain partial balancing of reciprocuting masses in alider crank 051.0 mechanism. [6].

CR

Explain primary exact and secondary crank in balancing of inline cylinder erezine. 161

The cranks and connecting rods of a 4 - cylinder in -line ergine running 51 at 1800 rpm are 60 mm and 240 mm each respectively and the cylinders are spaced 150 mm apart. If the cylinders are membered 1 to 4 in sequence from one end) the cranks appear at lowervals of 90° in an end view in the order 1-4-2-3. The reciproceting mass corresponding to each cylinder is 15 kg Determine. [121]

[]. Urbalanced primary and secondary forces if uny,

Unbalanced primary and secondary couples if any,

- Explain Turning Moment Diagram used in analysis of flywheel, Also 061.61draw Turning Moment Diagram for steam engine, 4-stroke angine and multi cylinder engine. 661
 - The radius of gyration of a flywheel is 1 meter and the floctuation of 53. speed is not to exceed 1% of the mean speed of the flywined. If the mass of flywheel is 3340 kg and the steam engine develops 150 Kw at 135 rout, then find: 1101

134

SULSSER

Maximum fluctuation of energy b.

936

Co-efficient of fluctuation of energy, 544.398

SC-82 Tetal No. of Pages (3

T.E. (Mech.) (Part-HII) (Semester-V) Examination, November- 2019 HEAT AND MASS TRANSFER

Sub. Code :66243

Day and Date (Wednesday, 27-11-2019

Total Marks : 100

Time : 2.38 p.m. to 5.30 p.m.

Sent Nu.

- 1) All questions are compalsory.
 - 2) Figure to the right indicate full marks.
 - 3) Assume suitable data whenever necessary and state it clearly.
 - Use of specific calculators is permitted.

Q1) Solve any three

Instructions:

- Write Differential equation of conduction in Cartesian co-ordinate system. Also give the Laplace equation, poisons equation. [6]
- Define critical radius of insulation. Also derive the equation for critical radius of insulation for hollow cylinder. [6]
- c) A wall of house consists of three layers, an outward brick work 15cm thick an inner wooden panel 1.2cm thick, the intermediate layer is made up of an insolated layer 7cm thick. The thermal conductivities of brick, wood and insulating material are 0.7 W/m-K, 0.18 W/m-K and 0.1633 W/m-K respectively. The inside and outside temperatures of wall are 21 °C and and 15°C respectively. Calculate the rate of heatloss per unit area of the wall. [6]
- 6) A long rod of indias 50 nm with thermal conductivity of 10W/m-k contains radioactive material, which generates heat within the cylinder at a rate of 0.3×10° W/m³. The rod is cooled by convection from cylindrical surface having fluid temperature 50 °C and heat transfer coefficient 60 W/m²K. Determine the temperature at the centre and at the outer surface of the cylindrical rod. [6]

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(Q2) Solve any two:

- Explain Lumped heat capacity analysis. Also give the physical significance of Fourier's number and Blot number. [8]
- A stabilets steel fin (K=20W/m-K) having diameter of 20 mm and length of 0.1m in attached to a well at 300 °C, due ambient temperature is 50°C and the heat transfer coefficient is 10 W/m°K. The fin tip is insulated. Determine.
 - 1) Rate of heat dissipation from the fin-
 - Temperature at the fin tip.
 - The rate of heat transfer from the wall area covered by the fin if the fin was not used.
- c) A cylindrical stainless steel ingot (K=45W/m-K), 15cm diameter passes through heat treatment forusce which is 6m in length. The temperature of furnace gas is 1300 °C. The initial ingot temperature is 100 °C. The heat treaties coefficient is 100W/m°K. Calculate the time required for ingot to attain a temperature of 850 °C. Also calculate velocity of ingot through the furnace [8]

Q3) Solve any two:

- State planks how and Wirn's law of radiation. Hence derive Wien's law from planks law
- (b) Define radiation shape factor. Also derive expression for radiation shape factor for cylindrical cavity having diameter D and depth L with respect to itself. [8]
- Calculate the following quantities for at industrial furnace assuming it as a binck body emitting radiations at 2650 °C 181
 - Monockrotnatic emissive proser at Lambda=1.2µm
 - 2) The wavelength at which conissive power is maximum.
 - Maximum monochromatic emissive power.
 - d) Total emissive power.

SC-82

Q4) Solve any two:

- Derive an expression for affectiveness of counter flow heat excharger in terms of NTU.
- What are the different dimensionless numbers in operaction? Give physical significance of each.
 [3]
- a) A counter- flow shall and take type heat exchanger is to be used to cool water from 22°C to 6°C using brine entering at -2°C and leaving at0°C. The overall heat transfer coefficient is estimated to be 500 W/m°C. Calculate the heat transfer sorface area for a design heat load of 10 kW.

Q5) Solve any two;

- Discuss the regimes of pool beiling with the help of pool beiling curve [8].
- b) Define Grashoff's number and Reycolds number in control and forced convection and explain the significance.
- With the help of dimensional analysis prove that Nusselt number is function of Grashoff's number and printilit number. [8]

Q6) Write short nows (Any three)

- a) Fouling factor in use of heat exchangers
- b) Dropwise and filmwise condensation
- Design considerations for heat exchangers.
- d) Porend convection boiling.

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[18]

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T.E. (Mechanical) (Part - III) (Semester - V) (Revised)

Examination, November - 2019

MACHINE DESIGN - 1

Sub. Code : 66244

Day and Date : Priday, 29 - 11 - 2019 Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

1133

Instructions: 1) All questions are compulsory.

- 2) Pigners to the right indicate full marks,
- Make suitable assumptions wherever required and state theta clearly.
- 4) Use of non-programmable salestator is permitted.
- 5) Draw near diagrams wherever necessary.

Q1) Solve any Threet

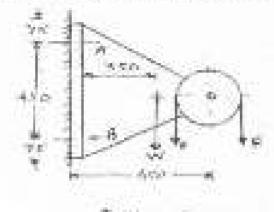
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- Summarize the guidelines for the selection of quantitative values of 'factor of safety',
- b) Suggest with Justification the suitable material for the following:
 i) Boller shell ii) Valve spring iii) Cutting tools
- 4) Explain design procedure of Knuckle joint with next sketch.
- Create a table showing different types of accesses in bolt design along with sketches.
- Q2) at A right angled bell-crank lever is to be designed to raise wiend of 5 kN at the short arm end. The lengths of short and long series are 100 and 450 mm respectively. The lever and the pins are made of steel 30C8 (Syt = 400 N/mm²) and the factor of safety is 5. The premissible bearing pressure on the pin is 10N/mm². The lever has rectorgular cross section and the ratio of width to thickness is 3.1. The length to diameter ratio of fairerun pin is 1.25:1, Celenlate: [8]
 - b The diameter and the length of inforum pin;
 - The shear stress in the pin;
 - ii) The distantions of boss of the lever at the fulcount stul-
 - (v) The dimensions of cross section of the lever.

Assume that the arm of bending moment on the lever extends up to the axis of fulerum.

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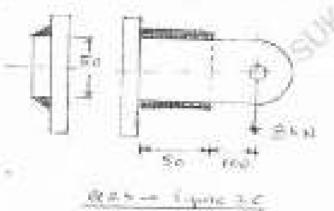
b) Figure 2.b shows a pulley bracket, which is supported by 4 boks, two at A and two of B location. The weight of pulley and bracket W is 2kN, and the load P on the rope is 20 kN. Determine the size of the bolts, using an allowable shear stress of 40 MPa for the bolt material. [8]



\$ 25 - Figure 2.33

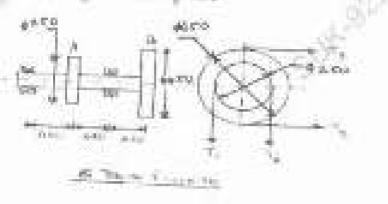


b) A weided connection as shown in figure 2c is subjected to the occentric force of 8 kN in the plane of the welds. Determine the size of welds if the permissible shear stress for the weld is 90 N/mm³. Assume static conditions.



- Q3) a) What types of arrenses are induced in shafts? How the shaft is designed based on rigidity? 502
 - b) Fig3b shows a line shaft supporting two pulleys A and B. Power is supplied to the shaft by means of vertical belt on palley A, which is unsusceed to pulley B carrying horizontal belt. The ratio of belt tension.

on the tight and loose side is 3:1. Assume maximum Allowable tension in belt as 2.7 kN. The shaft is made of plain carbon steel 40C8 (Sa - 650 N/ mm1 and S1 = 380 N/mm2). Determine the size of the shaft according to ASME code if K_ = 1.5 and K_ = 1.6



OR.

Design a rigid type of flange coupling to contect two shafts. The input 65 shaft transmits 7 kW power at 800zp.m. to the output shaft through a coupling. Assume that design tompor is 1.5 times the rated torque. Given: moterial for shaft = 40C8 (Syt=330 N/mm², factor of antery=2.5), material for key=30628 (Syt=400 N/mm¹, factor of safety=2.5), material for flatge FG 200 (Sut=200 Minm¹, factor of asfety=6 based on ultimate strength)

041 m Derive an expression for defloction of helical spring of through wire. (6) b) Safety valve of 60 mm diameter is to blow off at a pressure of 1.2 N/ mm2. It is held on its seat by closed coil helical spring. The maximum lift of valve is 10 mm. Design a suitable compression spring of spring index 5 and providing on initial compression of 35 non. The maximum alway stress in the material of wire is limited to 500 Norm?. The modulus of rigidity for spring material is 80 kN/min2 Assume squared and ground ends. Draw aketch of the spring Calculater 1166

Diameter of the spring wire ĺb. Mean coil diameter 12.

iii) Number of active turns and (v) Pitch of the coll

Assume What's Stress factor $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$

Standard wire gauge (SWG) member and corresponding disperter of spring wire is given in the following table,

swa	449	50	6.0	7.02
Diamoter (mm)	30.180	10.973	11,785	12.70

134

SC-85

1101

161

Q5) 6) What do you understand by overhauling and self locking of power screw? Hence deduce the condition for solf locking screw. [6]

OR

6

- a) What its recirculating ball servery? Explain with next shelph
- b) A popular screw having double start square threads of 25 mm nominal disinator and 3 mm pitch is acted upon by an axial load of 10 kN. The nuter and inner diameters of acrew oddlar are 50 mm and 20 mm respectively. The coefficient of thread friction and collar friction may be assumed as 0.7 and 0.15 respectively. The screw rotates at 12 rpm. Assuming uniform wear condition at the collar and allowable thread bearing pressure of 5.8 N/mm³, Find [12]
 - The tocque required to rotate the screw.
 - ii) Stross in the screw.
 - (ii) Number of threads of not in engagement with access.
- Q6) a) Explain the step by step proceedure for selection of V-balt from Monthscience's Catalogue. [6]
 - b) It is required to select that beit drive for a fan running at 360 rpm which is driven by a 10 kW 1440 rpm motor. The belt driver is open type and space is available for a center distance of 2 m approximately. The bait should operate at velocity between 17.80 m/s to 22.90 m/s. The power immersiming capacity of the belt per mm width per ply at 180° are of contact and at a belt velocity of 5.08 m/s to 0.0118 kW. The load correction
 - Befor can be taken as 1.2. Suggest preferred pulley diameters for the motor and fan pulleys and give complete specifications of balting. Refer the tables given below. [10]

Data for Flat Belt Q. No. & b.

Are of Centact Factor (F.)

a_j (Deg)	130	140	150	150	170	180	190	209
F.	1.26	1.19	1.13	1.08	1.64	1,00	0,97	0.94

44.000	214	ndant.	Witth	s of th	iese 1	680 F	n mm			
$1 - \operatorname{Fly}$	35	40	.20	.63	-76					
4+Pty	40	244	.50	63	76	90	100	132	129	152
F-Ply	75	100	.112	125	152					13
6 - Ply.										127

0 0 0

SC - 90 Tetal No. of Pages 13

Seat No.		
1.44.64	i i i i i i i i i i i i i i i i i i i	

T.E. (Mechanical) (Part - III) (Semester - V) (Revised) Examination, December - 2019 MANUFACTURING ENGINEERING Sub. Code : 66245

Day and Date : Monday, 2 - 12 - 2019 Time : 2.30 p.m. to 6.30 p.m. Total Marks : 140

Instructions:

- 1) AB questions are compulsory.
- 2) Figures to the right indicate full marks.

3) Average suitable data wherever necessary and state is dearly.

4) Use of non-programmable colculator is allowed.

Q1) Solve any Two-

- a) Exclusion different types of ohips with next labeled diagram.
 [8]
- b) Explain different types of tool material and list important properties of tool material.
 [8]

 an orthogonal costing operation, the following data has been observed: Width of cut = 2.5 mm

	=0.25 mm
Chip thickness	= 0.75 mm
Cutting force	~ 950.34
Thrust force	- 475 N
Rake anglu	

Determine: Chip thickness ratio, shear angle, shear force and normal force on shear plane, friction force and normal force on the chip real coefficient of friction. [8]

Q2) Solve any Two

- Explain the types and causes of tool wear with next elected.
 [8]
- b) Draw tool accornerry of drill and explain summerclature in detail. [8]
- c) While muchining C40 steel with HSS tool at a food rate of 0.75 mm/rev and 2 mm depth of cut, following observations were noted. Assuming Taylors equation as VT^{*} = Constant, recommend the cutting speed for desired tool life of 50 minutes.

Clutting spaud (m/min)	- 40	69
Teat life (min)	- 70.1	-25

181

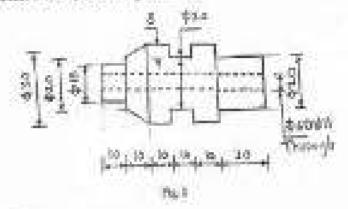
 ETO_{c}

SC+90

Q3) The component shown in Fig. 1 is to be processed on a single spindle automat. Study the component and prepare: [18]

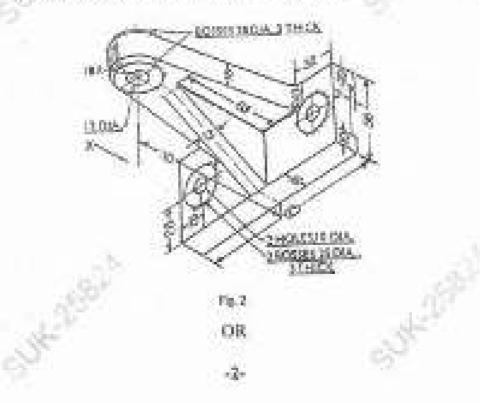
- a) Detailed process sheet
- b) Tool layout
- c) Cam profile for drilling operation

Material: M.S. #30 mm polish ber



Q4) Solve any One

a) Design and draw a nest dimensional drawing in three views with one sectional view of a suitable drilling jig for drilling two holes of # 10mm as shown in Fig. 2. Show clearly the details of location, clamping and guiding of tool. Assume this as a fisal operation. [26]



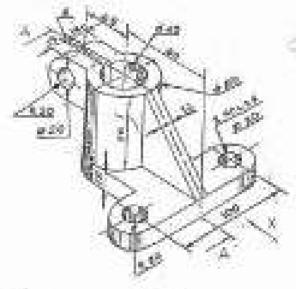
SC - 90

61

祖2王

West and

h) Design and draw a dimensional drawing in three views with one sectional view of a milling fixture, for producing the 36 mm slot at the component shown in Fig. 5. Show clearly the details of location, clamping and setting of entrep. Assume this as a final operation. [26]



Pg.F.

(Q5) Solve any two-

- Replain different methods of reducing cutting forces in press working. [6]
- Explain center of pressure in press working.
- c) A waster of 12.5 mm internal hole and an outside diameter of 25mm is to be made from 2 mm thick strip of 0.2 percent carbon steel. Considering the elastic recovery of the material, find: [6]
 - The blanking die opening size and the blanking purch size.
 - ii) The piercing punch size and the piercing die opening size. (Assume clearance is 5% of strip thickness)

Q6) Write short notes on any Three

- a) CNC atom and drivers.
- b) Automatic pallet changes.
- c) Tool presenting
- d) Modular tooling system for turning

SE -80 Tatal Na. of Page ()

T.E. (Mech) (Semester -V) Examination, November - 2018 CONTROL ENGINEERING

Sub. Code : 66241

Day and Date (Monitary, 19-11-2018

Total Marks : 144

Time : 10.00 a.m. to 01.00 p.m.

Sect

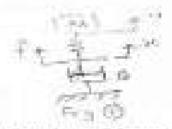
No.

Instruction) 1) All greations are receptively.

Diffect annihog,

2) Assume neitext: tisks if required and scention is elegate.

QD s) A mechanical system is shown below. Determine the equation which relaxs s and f.



B) For electrical system ibown in fig. 2 construct on optivalism mechanical system using [6]

100

Te a

Diverse analog.

2 - Cont

c) Explain mathematical model of gene train.

Q(2) a) For operating carves chown. Determine Source approximation for torpos 'r'



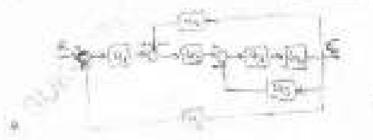
ET.05

163

|S|

b) Reduce the block diagram shown in Tig, and other interester function [8]

SE - 80



QD 4) For unity feedback control system shown in fig. calculate value of K₂ as that system is critically damped. Also calculate maximum overshoot and setting time. [8]



 Determina the response c(i) for (0) = a, u(i), d(i) = 0 and all initial conditions are zero.
 181



Q.6 s) Sketch root locus plot fre $G(x), H(x) = \frac{K}{x(x^2 + 5x + 12)}$ [10]

-24

b) A unity See Back control system is having an open (cop transfer function $G(x) = \frac{K(x+12)}{s(s+3)(s+7)}$ Determine mage of values of K for the system to be stable . [6] QS(-a) Draw the body plan for unity familiants control system with. [12]

 $G(x) = \frac{10(x+10)}{x(x+3)(x+3)}$. From the plot determine values of gain mergin and phase matrix.

 $|||6||_{1}$

b) (Obtain y(t) when s(t) is a unit step for the system.



Q60 a) Determine more spoke representation and comparer diagram using perulisi programming. [8]

$$f(t) = \frac{1}{(D+2)(D+3)}f(t)$$

its Determine state space representation and contraster diagram using series programming. [8]

$$y(t) = \frac{D+3}{(D+1)(D+2)} f(t)$$

DD

1.16

arap

SE-81

Total No. of Pages 2 3

Total Marks: 100

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and the second sec	

T.E. (Mechanical Engineering) (Semester - V) Examination, November - 2018

THEORY OF MACHINES - II (Revised)

Sub. Code : 66242

Day and Date ; Truesday, J2 - 11 - 2018

Time: 10.00 c.m. to #1.00 p.m.

- Instructions: 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Draw coat labeled skitch whenever nerosures.
 - Assume if necessary autobic data and state clearly.
 - 5) Use of Nen-programmable coloristor is permitted.

(27) a) Derive the expression for the length of path of econect with usual metations. [8]

08.

Derivation responsibility for minimum number of teeth coquired on wheel to evold interference in much with gear.

b) A pair of gears, llaving 40 and 20 teeth respectively, are rotating in moti, the speed of the anolier being 2009 rpm. Determine the argle through which the pinion times offile any pairs of teeth are in contact. Assume the gear teeth are 20° involute form, addendari length is 5 mm and the module is 5 mm. [10]

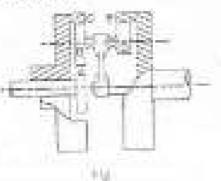
Q2) a) How the velocity case of approvalit generation is obtained by tabular method. (6)

03

Motie "A" excits a constant torque and is general to shaft 'B'. The speed of whaft 'B' is G times the speed of motie. Show that the angular-

acculutation of the shuff 'IS' is maximum when $G = \sqrt{\frac{I_0}{I_K}}$, where, \overline{v}_{μ} and

Is not the total cases moments of identic of revolving parts attached to the respective shafts. b) An apprychic geor main, as shown in Fig. the driving wheel 'A' has 14 useds and the fixed annular wheel 'C' 100 meth, the ratio of tooth members is wheely 'E' and 'E' is 98. 41. If speed is 1200 mm of wheel 'A', find the speed and direction of 'E'. [30]



- Q.D i) Write a state on symptote.
 - b) A near engine automobile is teaceffing along a tack of 100 m manneality. Each of 4 road wheels have moment of inertia 2 kg/m² and effective dramoter 60 cm. The matering parts of engine have moment of inertia of 1 kg/m². The engine artis is parallel to rear and and churk short rotates in the same same as the road wheels. The gest ratio between engine to back aide is 3 t 1. The which weight 1500 kg and has C/G 30 rm above nod level. The width of track of voltations 1.5 m. Determine the limiting speed of vehicle around the curve for all four wheels to maintain contact with the road surface if this is not combined.
- (b() a) Derive an expression for connection couple to be applied to make two mass system dynamically equivalent. [6]

OR:

Derive an expression for velocity and acceleration of the slider of slider erask mechanism.

b) A connecting rod of an LC engine has a many of 2 kg and the distance between the centre of gudgeon pin and centre of enable pin is 250 mm. The C.G. falls at a point 100 mm from the gudgeon pin along the litte of centres. The radius of gyration about net axis through the C.G. perpendicular to the plane of rotation is 110 mm. Find the equivalent dynamical system if only man of the masses is located at a gridgeon pin.

If the connecting rod is replaced by two masses, one at the globgeon pln and the other at the cruck pin and the angular acceleration of the colis 23000 radial clockwise, determine the connection counte epplied to the server to reduce it to a dynamically equivalent system. [10]

1945

Q50 a) Deplain direct and reverse quark method for balancing of the redial explains. [61]

OSC

Explain different cases of balancing of rotating masses.

- b) A malial acro-engine has seven cylinders equally spiritd with all the connecting rods coupled to a contrast coupled. The starth and excit of the connecting rods are 200 mm and 800 mm corpectively. The occiprocolog mass per cylinder in Fig. Determine the megatitude and its atguta position of the balance masses required at the crank radius for complete primary and secondary halancing of the engine. [12]
- (26) a) Explain maximum fluctuation of energy and coefficient of fluctuation of energy. 101
 - (b) A meti-cylinder engine is to run si appeal of 500 spin. On answing the mexing moment diagram to x usale of 1 mm = 3°, and 1 mm = 250 N-m, the areas above and below the mean to spin line in mm² area ± 160, -172, ± 168, -191, ± 107, -162. The spinal is to be kept within ± 1% of the riskin spinel of the expansion of a rectangular flywbeel the flywbeel. Determine the satisfie dimensions of a rectangular flywbeel run if the breadth is twice its thickness. The detaily of the mex hon is 7250 kg/m² and risking to MPa, Assame that the inconstructes 925% of the flywbeal atterns.

1. Walter

Total No. of Pages : 7

Total Marks : 190

T.E. (Mechanical) (Part - III) (Semester - V) Examination, November - 2018

MACHINE DESIGN - L(Revised)

Sub. Code : 66244

Day and Date : Wednesday, 28 - 11 - 2018

Time : 10.99 a.m. to 01.00 p.m.

Intraction [1] All quarties are computers.

- 2) Figuren to the right testinite fait modes.
- Molecusturble accomptions wherever required and state them density.
- Use almost arreground etc. estimation to permitted.
- 5) Brow and diagrams wherear rememary,

Q() Solve any Three :

a) Summarism procedure to design a martane element.

b) Staggest with justification the suitable maternal for the difference :-

- 0 Pressure Cooker
- 0 BolerShelt
- al Cutting fool.

a) State the sasamptions in design of a knockle joint and explain in detail design of pip with the help of next closely.

- 40 Morsels V Juiti joint (any two types). Disatus design of but weld joint under tension.
- Q2) a) A turn-buckle is used to fighten a topic. Single start appart threads are to be used and subjected to a motimum rope receipt of 15 kN. The geneticsable tensile are as for the steel rods used is 70 MPa. The promissible pointle and shear areas for the cast increase is 10 MPa. Design the turn-backle.
 - b) Figure 2b shows a cast iron bracket fixed to the sizel atmentice, it supports load P of 26 KN. There are two bolts at A and two bolts at B. The distances are as follows: I =45mm, I =180mm, I =180mm, Eleternities the size of the bolts, if maximum permiasible tensile areas in the bolt is SUN/mm¹, Refer Table 1. [8]

67.0,

 $\{18\}$

Sed No.



c) Figure 2z shows a plote bracket welded to a wool column; and loaded accentrically. Determine the size of weld, assuming the maximum shear stress induced in the weld 150 N/mm².

Given F=15kN, b=150mm



- Q.0 a) What are different types of atteves induced in shafts? How the shaft is designed based on rigidity? [6]
 - (b) Fig.3b shows a line shaft supporting two pulleys A and E. Power is supplied to the shaft by mount of a vertical belt on palley A, which is transmitted to pulley B on rying horizontal belt. The ratio of belt tension in the tight and loose side is 3.1. Asserte maximum attomatife tension in the belts 2.7 kN. The shaft is made of plain carbon stepl 40008 (S₂=630N/mm² and S₂=380 N/mm²). Entermine the size of the shaft arcording to ASME code if k_i = 1.5 and k_i=1.0. [10]



124

Design a night type of flarge coupling to connect two shufts. The reput shaft incomits 7 kW power at 800 (p.m. to the output sheft through a coupling. Assume that design torque is 1.6 times the rated toque.

Convect material gat shuft = 40CB (R.	= 390Wmarr, factorial safety = 2.5),
materia for key- 98, 8 (S, -400% mp	"; factor of artistics 7.5), rentarial for
Harge FC 20048 - 205Mmmy factors	faulory - (heard or ultimate strength)

Designation	origination Phole M (tran) S (diam		Minor se Care dianator (mmg	Truide spass area (mm ²)	
M20	2.55	20	Jagan	245	
- 3424	3.00	.34	20.319	355	
3456	1.50	31	25.706	363	
M26	1.00	.56	31.093	217	
M42	4.52	42	36.479	1120	
3405	5.00	48	41.865	1470	

Debis D

Q-Q ab Deriver an expression the doffsection of fredient spring of circular wire. [6]

- b) Safety video of 60 mm diameter is to blow off of a pressure of 1.2 Nimor, It is held on its searby closed coil belieal spring. The metainion left of valve is 10 mm. Design a sainable compression spring of spring index 2 mm providing in initial compression of 35 mm. The metaines share stress in the initial of whe is limited to 500 N/mm². The metalus of ngidity for spring material is 80 abitmo?, Assume squared are ground ends figlicitize: 108
 - 0 Diminister of the spring wire
 - Mention dometer
 - (ii) Number of active tiens and
 - (b) Pica of the roll-

Assume Whole Stores factor K-4C-1, 0.015

and a fe

 $\{12\}$

Staniberi wire gauge (SWG) number and corresponding diameter of apring wire is given in the following table.

SWG	4/0	30	-592	7/0
Dimeter	10.160	10.973	11.585	12.70
(mm)	123	1.1		

Q53 a) What do you understantiby overhauling and self locking of power screw? Hence deduce the condition for self locking screw. [6]

What is recirculating ball screw? Explain with near electch

- (b) A power screw having double start square finesals of 25 mm nominal diameter and 5 mm pitch is acted upon by an axial load of 10 kN. The outer and inner diameters of screw collar the 50 mm and 20 mm respectively. The coefficient of theread friction and collar friction maybe assumed as 0.2 and 0.15 respectively. The screw relates at 12 pm. Assuming uniform were condition at the collar and allowable thread bearing pressure of 5.8 Ninni?. Find : [10]
 - 0 The torque requires to rotate the serow.
 - 8) Stress in the sofew
 - 10 Number of firmeds of not in negagement with server
- Q60 a) IIsplain the step by step procedure for selection of Flat belt from Mainefacturer's Catalogue. 167
 - b) It is require to design a V-belt drive to connect a 20 kW, 1440 rpm. Motor to a compressor running at 400 rpm for 15 hours per day. The space is available for a center distance of approximately 3.2 m. Rafer following data.

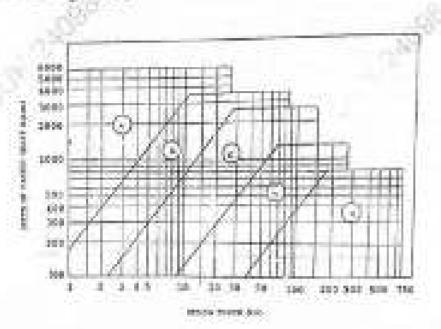
Determine :

- 0 Diameters of router and compressor suffey
- 1) Belt exectifications
- ii) Convet eveter distance
- iv) Number of belts-

71090

Data for V Belt O. No. 6 b

The star



Proversating of Vibelts (vs = 100°, speed of the finite pulses - Jack open).

(Propulsy discourse (rest); FR + News using in \$29)

Tetha	10	79	- 66	10	- 95	100	105	113	118	133
A.	R	. 659	3.88	639	1.12	1.18	1.50	1.83	S.a.	2.00
Station	11	172	132	149	100	100	170	100	190	100
0	28.	3.26	249	2.77	1.36	540	1.07	439	4.37	5.29
Setter	0	700	111	224	-225	250	385	214	300	311
с	19	634	641	944	5.28	8.49	13.10	11.10	12.10	12.30
Section.	Ф.	100	0.75	470	63	-		-		-
10	19	18.7	174.	0.1	2.45	_			_	_

Distantions of strendard accounts to an

B4	Section	Wkith Withind	Trainer Times	Mississie pitch. dimension of publicy losses
57	A.,	п	1	125
	3	12	11	200
	0	- 22	10	200
	25	- 12	18	300
	26	38	33	650

For which a

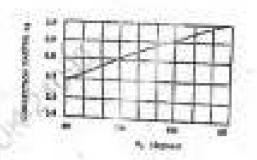
Solve of professed values for pitch damasters (or goal are as below):

$T_{\rm pub}$	Rape	1120	0 123	132	141	110	114	111	135	194
200	212	224	213	200	243	140	3.00	101	325	3:51
400	63	450	415	800.	690.	100	190.	80	429	710
396	869.	908	3800							

Controlling factor (7) for latitudes storage

Type eLegendre	Operational hears per stay				
All and a second as	0.40	1646	15-74		
 Light depy agineter-thread-membrail pumps fine (up to 7.5 kW) and comprision 	11.1	22	1.2		
 Mycham dary: conveyencies (starse 7.3 k7 line chaffs machine pools-presser and point) 	YR				
dagasesen punja	(13)	103	34.		
 Hervy duty, oursidgets-bucket deveters and facements 	-13	31Å	135		

Difference between plich length and inside length (wat) 36 48 56 79 92	Enk-Swifter	A.	11	- C	11	10.5	
	and the second se	ж	43	56	79	92	
	1.10						



Consistion factor its are of contact (V-groupes on both pulleys)-

Consistive term A for peltilarger Here we reside to be been at the test to -

	-	-	COLUMN FOR DAYS	register data s	di la antò		
	6		1000	lish sortion			
		. A	- 8	. C.	12		
	1201	130	0,00	0.67	-	-	
10	1993	6,28	8.85			-	
	2032	1.0	1.16	1.00	-	-	
	0007	- 7.94	8.94	0.89			
÷	2159	1.05	1.99	0.99	-	1.0	
	1304	1.00	1,89	6.92		1.1	
	200	1.106		0.52	1.00		
	2464		1.02	100	1.0	- C. M. L.	
	2345		1.49		1.55	2.7.2	
	(1288t	1.02	1.94	0.94		Cardon H	
18	2845	3.01	1.89	0.55	1 de 1	143	
1.7	3848	112	11107	0.57	0.80	1.4	
	527	100	-	0.92		1.0	
	3251	1.14	106	0.95	5.87	1.565	
	3404			0.92	- 22		
	2678		110	3,09	9,90	1.00	
	4218		3.13	1.02	9.87	1.00	
	40.03	-	3,16	1.08	0.92	1.0	
	404	-	1.35	1241	0.59	1.00	
	672		1.26	1.05	0.91		
	1886		1.18	1.00	0.96	1.1	
	2324	1.4	1.19	1.08	6.96	0.94	
	6045	1.0		1.11	L00	0.00	
	007	S	100	1.14	1.00	100	
	1565	M	1.245	136	1.05	1.01	
						these .	
ch.	32		- 58			200	
2			1	79)			

SE - 82

Total No. of Pages 13

Total Marks : 200

126

T.E. (Mechanical) (Part - II) (Semester - V) (Revised) Examination, November - 2018 MANUFACTURING ENGINEERING

Sub. Code : 66245

Duy and Dute : Friday, 30 + 11 + 2018

Time : 02.30 a.m. to #1.36 p.m.

Jamuations D

Seat

Nec

- All grantions are compolicity.
- 2) Figures to the sight indicate full marks,
- 3) Assume and also data wherever necessary and state is clearly.
- Unstrum-programmable calculate in allowed.

Q1) Solve may Two

- to Explain different types of chips with next labeled diagram.
- b) What is muchinability? Exploin various flattees effecting machinability [8]
- c) In an orthogonal cotting operation, the cutting form is USON, the feed thrust force is 670%, the rate angle 7°, fical is 0.10mm and stip thickness is 0.25mm. Calculate: Chip thickness ratio, shifts angle, shifts force and normal force at shere plane, friction force and normal space on tool face and coefficient of friction. [8]

QUI Solve my Two

- Explain the types and causes of fact waar with near sketch.
 [8]
- b) Drawtood scornery of milling cotter and explain nomanelature is detail [8].
- c) The following equation for tool life has been obtained for HSS tool. <u>27</u> 1.0, <u>222</u> a⁽⁰⁾ = C¹

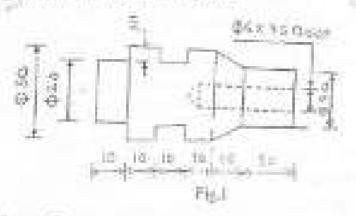
A 60 min, tool life was obtained using the following outting conditions:

V = 40 m/mm; f = 0.25 mm; d=2.0 mm

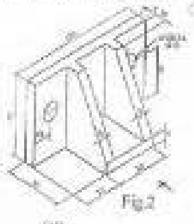
Culculate thereffect on tool life if speed, feed and depth of out are together increased by 25% and also if they are increased individually by 25% (8).

87.07

- Q35 The component shown in Fig.1 into be processed on a single-spletche automat. Study the component and prepara.
 - Detailed persons shaut
 - B) Stolinybin
 - Câm profile for drilling operation (\$6 X 35mm deep)
 Material: M.S. polisit hat \$30mm



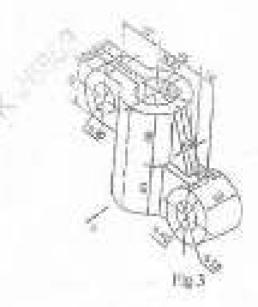
- Q47 Solve my One
 - ii) Design prictitizes a must dimensional drawing in these views with one sectional view of a suitable drilling jig for drilling two holes of \$15 mm in shown in Fig. 2. Show also by the density of loanties, champing and guiding of work Assume this as a firmi operation. (24)



- 0.00
- b) Design and thus a dimensional drawing in three views with one summand wizes of a milling finture. for producing the 6 mm wide slot at the component shown in Fig. 3. Show clearly the details of location, clamping and setting of cutter. Assume this we a final operation. [26]

[33]





Q17 Solve ary Two

- 4) Explain different methods of roducing catting forces in posts working [6]
- b) Explain contar of pressure in press weeking.
- (c) Estimate the blanking force to cut a blank 20mm wide and 30mm long from a L5mm thick metal wrig, if the alimnts show stores of material is 450% mm². Also determine the work store if the parameters parameters is 25 percent of material flockness. [6]

26/ Write short nows on any Three

[12]

Alter

264

- 4) CNC uses and drives
- b) Aizometic pellet charger
- a) Tool presiding
- d) Medular tooling system for turning

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SE - 806 Total Na. of Pages : 3

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T.E. (Merh) (Part - III) (Semester - V) Examination, November- 2018

HEATAND MASS TRANSFER

Sub. Code: 66243

Rup and Bane : Memlay, 26 - 11 - 2018

Total Marks | 103

Time : 10.09 mm, to 01.00 p.m.

Instructions; () All question or comprising,

2) Figure to the right indicator full muscla,

3) Assures suitable data whenever Nerosaary and State is clearly.

40 Dural specific extentation is perpetited.

QO Solvenity times.

- (a) Explain the different modes of fast transfer with suitable example and olso give basic law for each one. [6]
- b) Define efficient radius of localation. Also derive the equation for critical radius of localation for hollow cylinder.
 [6]
- a) An industrial forces: is designed to operate with an internal air temperature of ~10°C, when the external air temperature is 25°C. The taxenal and external lent transfer coefficients are 12 W/m/b and 8W/m/K, respectively. The wall of the freezor consists of an inner layer of plastic (k=1 W/mK), Joint faick and an outer layer of atalahout step) (k=16W/mK), transities, A layer of insulation transfer (k=0.07W/mK) is an dwithed between these way layers. Find the thickness of insulation required to onloce the convective limit loss to FSW/m².
- d) A steam pipe is covered with two layors of insulation, first layer being 3cm their and second 5cm. The pipe is made of steel (e=55W/m85) having ID of 16Dmm and OD of 170mm. The inside and outside film coefficients are 35end 5.6W/m/K, respectively. Coloriste the best lost per metre of pipe, IF the steam temperature is 300°C and air temperature is 50°C. The thermal conductivity of two insulating resterials are 0.17 and 0.093 W/mK, respectively. [6]

82.0.

(22) Solve stry Two

- Derive expression for temperature distribution of a solid cylinder generating heat at the rate of q unit per unit Volume. [8]
- A solid start ball from indiancter and initially at 450°C is quenched in a controlled environment at 90°C with convection coefficient of 105%m⁴K. Determine the first algebra by centre to reach a temperature of 150°C. Take thermo physical properties as develop=8006kg/m⁴, C=4200/kgK, k= 60 W/mK.
- The rate of basi generation in a slab of thickness 160mm (k=180W/m²C) is 1.2~10⁶W/m² if the temperature of each of the terface of solid in 120⁶C, Determine: 181
 - 1) The tomperature at the mid one sparser planes.
 - 10 The heat flow sate and tampentiture goadients at the mid and quarter plant.

QU Solve any Two

- a) Explain the different types of fine with the help of near shords and list different brandary conditions of the fine. [6]
- Derive the expression for temperature distribution in a fit of finite length with jupplated end.
- (i) Find out the amount of heat transformal through an iron fits of longth Stirum, widds 100 mm and thickness from. Assume k=110W/m8, and h=42W/m/K for the material of for and temperature at the base of the fit as 80°C. Also determine the temperature of the fits, if the amouphese temperature is 20°C. [8]

Q4) Solve any two of the following:

- With the help of dimensional analysis prove that Nastall number is a [40 function of Grashoffs curdler red Prayd) number.
- E) Give the physical significance of

101

- Beyunkia Number
 Grashulla Number
- iii) NatseltNumber
- 192 Prindil Number
- (i) A Cylindrical body of 300 mm diameter and 1.6 m height is maintained at a constant temperature of 36.5 °C. The surrounding on temperature in 13.5 °C. Determine the amount of last to be generated by the body per hear. Use the correlation, Nu = 0.12(Gr.Pr)²¹⁷. Take p = 1.025 km/m², y = 13.06 × 10⁻⁶ m³/n, C = 0.96 kJ/kg, K, h = 0.6892kJ/mHK and g = 1/298 K⁻¹.

Q51 Sober any three of the following:

- 10 Concept of Black Rody.
- b) Emissivity and Transminivity.
- (i) Various theories of realization heat transfer
- d) Statement and proof of Kirchoff's law

(26) Sales are two of the following:

- ii) Define the following terms related to the best overlast are:
 - D Effectiveness
 D Fouring factor
 D LMED
 D IN
 - a) LMTD (d) NTD
- b) Derive an expression for LMTD of counter flow heat exchanger.
- (1) Two fluids A and B exchange least in a course: flow heat exchanges. Fluid A cuters at 420°C and have a mass flow name of 1 kg/s. Fluid B extern at 20°C and have a mass flow rate of 1 kg/s. Effectiveness of heat exchanges is 75 %. Specific iterat of fluid A is 1 k3/sgeK and that of fluid B is 4k3/sgK.

SE - 806

1008

1167

Determine :

ii. Heat transfer now

4] Exit temperature of fluid It

SF - 88 Total No. of Pages 24

Seat	
350	 -

T.E. (Mechanical Engineering) (Part - III) (Semester - V) (Revised) Examination, November - 2017 THEORY OF MACHINES - II Sub. Code: 66242

Day and Date (Saturday, 11 - 11 - 2017

Time : 10.00 a.m. to 1.00 p.m.

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Total Marks : 190

Instructions :

- All quistion are compulsory.
- 2) Figures to the right indicate full marks,
- 3) Drow next labeled sketch wherever accessory.
- 4) Asseme if necessary suitable data and state clearly.
- 5) Use of Non programmable calculator is permitted.

Q1) a) Give the classification of Toothed Gearing and define the following tenus:

- Addendum.
- ii) Module.

OR.

Derive the expression for the velocity of sliding between pair of involute tooth and define the terms.

- i) PitchCircle.
- ii) Diametral Pitch.
- b) A pair of Spur gears with involute teeth is to give a gear ratio of 4 : 1. The arc of approach is not to less than the circular pitch and smaller wheel is the driver. The angle of pressure is 14.5°, Find
 - i) the least number of teeth that can be used on each wheel and
 - ii) the addencium of the wheel in terms of the circular pitch [10]

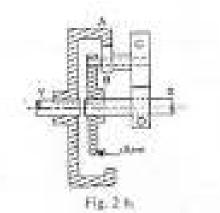
181

Q2) a) What are the various types of the torques in an epicyclic gear train. [6]

OR.

Explain the concept of equivalent mass and memory of inertin opplied for generations.

b) "Fig. 2 b shows an epicyclic gaar train with compound planets 'B - C', 'B' has 15 teeth and meshes with an annulus 'A' which has 60 teeth. 'C' has 20 teeth and meshes with the sumwheel 'D' which is fixed. The annulus is keyed to the propeller shaft 'Y' which rotates at 740 rad's. The spider which carries the pins upon which the planets revolve is driven directly from main gear box by shaft 'X', this shaft being relatively free to rotate with respect to wheel 'D'. Find the speed of shaft 'X', when all the teeth have same module. When engine develops the 130 kW, what is the holding torque on the wheel 'D'? Assume 100 percent efficiency throughout [10]



Q3) a) Condition for stability of two wheel vehicle moving in a surved path. [6]

- b) A ship propelled by a turbine rotor which has a mass of 5 tonnes and a speed of 2100 rpm. The rotor has a radius of gyration of 0.5 m and rotates in a clockwise direction when viewed from the stern. Find the gyroscopic couple in the following conditions.
 - i) The ship sails at a speed of 30 km/h and steers to the left in a curve having 60 m radius.

1001

ii) The ship pitches 6 degree above and 6 degree below the horizontal position. The bow is descending with its maximum velocity. The motion due to pitching is simple harmonic and the periodic time is 20 seconds.

6 The ship colls and at a certain instant it has an angular velocity of 0.03 rad/s clockwise when viewed from stern [10]

Q4) a) Derive the equation for inertia torque analytically considering the effect of inertia of the connecting rod. [6]

OR

Durive an expression for velocity and acceleration of the slider of slider crank mechanism.

- b) In a vertical double acting steam engine, the connecting rod is 4.5 times the crank. The weight of the reciprocating parts is 120 kg and the stroke of the piston is 440 mm. The engine runs at 250 rpm. If the net food on the piston due to steam pressure is 25 KN when the crark has turned through an angle of 120° from the top dead centre, determine the
 - i) thrast in the connecting red.
 - ii) pressure on the slide bars.
 - iii) tangential force on the cruck pin.
 - (v) thrust on the bearings.
 - v) turning moment on the crank shaft.
- Q5) a) Explain balancing of single rotating mass by two masses rotating in different planes. [6]

OR:

Explain direct and reverse crank method for balancing of radial engine.

63a

161

- b) The crank and the connecting rod of a 4 cylinder in-line engine running at 1800 rpm, are 60 mm and 240 mm each respectively and the cylinders are spaced 150 mm spart. If the cylinders are numbered 1 to 4 in sequence from one end, the cranks appear at intervals of 90° in an end view in the order 1 - 4 - 2 - 3. The reciprocating mass corresponding to each cylinder is 1.5 kg. Determine:
 - Unbalanced primary and secondary forces, if any, and
 - Unbalanced primary and secondary couples with reference to central plane of the engine. [12]

Q6) a) Derive expression for energy stored in a flywhoel.

b) A single cylinder double acting steam engine develops 150 kW at a mean speed of 80 rpm The coefficient of fluctuation of energy is 0.1 and the fluctuation of speed is ± 2% of mean speed. If the mean diameter of the flywheel rincis 2 meter and the hub and spokes provide 5% of the cotational inertia of the flywheel, find the mass and cross-sectional area of the flywheel afm. Assume the density of the flywheel material as 7200 kg/m². [10]

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SF-89 Total No. of Pages : 3

T.E. (Mechanical) (Part-III) (Semester-V) (Revised) Examination, November - 2017 HEAT AND MASS TRANSFER Sub. Code : 66243

Day and Date : Tuesday, 14-11-2017 Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

Instructions:	15	All-Questions are
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- All Questions are encouloury,
- 2) Figures to the right indicate full nearlys,
- 3) Assume Suitable Data wherever necessary and state it Clearly.
- 4) Use of scientific non-programmable calculator is permitted.

Q1) Solve any three:

Seat.

No.

- befine critical radius of insulation. Also derive the equation for critical radius of insulation for hollow sphere. [6]
- b) Explain the different modes of mass transfer. Explain with suitable examples. [6]
- c) A 0.8m high and 1.5m wide double pane window consist of two 4mm thick layer of glass (k = 0.78 W/mK) separated by 10mm wide stagnant sit space (k = 0.0626 W/mK). Determine the rate of heat transfer through this window when room is maintaized at 20°C and outside air is at -10°C. Take convective heat transfer coefficient as 10 and 40 W/m²K. [6]
- d) An aluminum pipe curries steam at 110°C. The pipe (k = 185 W/mK) has an inner diameter of 10cm and outer diameter of 12cm. The pipe is located in a room where the ambient air temperature is 30°C and convective beat transfer coefficient is 15 W/m²K. Detennine heat transfer note per unit length of pipe. Neglect convective heat transfer on steam side.

Q2) Solve any two:

 a) Derive expression for temperature distribution of a solid cylinder generating heat at the rate of q unit per unit volume.
 [8]

P.T.O.

SF-89

- Derive expression of temperature distribution for a solid body by using b). lumped heat especity approach. 181
- A solid copper sphere of 10cm diameter (p = 8954 kg/m², C) = 383 eYJ/kgK, k=386 W/mK). Initially at uniform temperature 250°C, it suddenly immersed in a fluid which is maintained at uniform temperature of 50°C. The heat transfer coefficient between sphere and fluid is 200 W/m/K. Determine the temperature of copper sphere at 5 minutes after immersion.

181

Q3) Solve any two:

- Derive an expression for temperature distribution along the length of a 26 pin fin with insulated tic. [8]
- A 1m long. Sem diameter cylinder placed in an atmosphere of 40°C is b. provided with 12 fins (k = 75 W/mK), 0.75mm thick. The fins protrudes 2.5cm from the cylinder surface. The heat transfer coefficient is 23.3 W/m/K. Calculate the rate of heat transfer if the surface temperature of cylinder is 150°C. 181
- Determine thermal conductivity of long solid 2cm diameter rod, 1 end of (0)the rod is inserted in a furnace while remaining portion is projected out in alr at 30°C. After stendy state has been reached, the temperature at two points on the rod which are 10cm spart are measured and found to be 120°C and 90°C respectively. If heat transfer coefficient is 20 W/m²K. What will be thermal conductivity of the rod? [8]

Q4) Solve any two of the following:

- With the help of dimensional analysis, analyze natural convection heat 831 transfer problem. 81
- A vertical cylinder 1.5m high and 180mm in diameter is maintained at bb100°C in an atmosphere environment of 20°C. Calculate heat loss by free convection from the surface of the cylinder. Assume properties of air at mean film temperature as, ρ = 1.06 kg/m³, γ = 18.97×10 fm³/s. C =1.004 kbkg*C and k=0.0283 w/m*C, Pr = 0.708, [8] UKE

Use convibuice: Nu = 0.10 (Gr.Pr)19,

SE - 89

[8]

16E

- Air at a temperature of 20°C flows through a rectangular duct with a 63 velocity of 10m/s. The duct is 30cm×20cm in size and air leaves at 34°C. Find the heat gain by air when it is passed through 10m long duct. The properties of air at 27°C are p=1.1774 kg/m², Y= 15.68 10 fm³/s, C,=1957 J/logK and k=0.03003 W/mK, Pr = 0.708. 8 Use correlation ; Nu = 0.023 (Re)⁶⁴ pc²⁴
- Q5) Solve any two of the following:
 - Write a short notes on; 13
 - Shape factor and its properties Ð.
 - Rediation shield īθ.
 - b) Write plank's law and derive Stefan Boltzman law from Plank's law. [8]
 - c) The effective temperature of a body having an area of 0.12m² is 527°C.[8] Calculate:
 - The total rate of energy emission Ð.
 - 12 The intensity of normal radiation
 - ii) The wavelength of maximum monochromatic emissive power
- Draw the temperature distribution curve for following heat 061.01exchangers (any 3) 161
 - Counter flow heat Exchanger Ð.
 - ii) Evaporator
 - Parallel flow heat Exchanger 80 E
 - iv) Confermer

ares

- What are the design considerations of heat exchangers? 61
- c) The flow rates of hot and cold water streams running through a parallel flow heat exchanger are 0.2kg/s and 0.5kg/s respectively. The inlet temperatures of hot and cold sides are 75°C and 20°C respectively. The exit temperature of hot water is 45°C. If overall heat transfer coefficient is 325 W/m²⁰C, calculated the area of heat exchanger. Assume C_{μ} of WH-SDG 19 water 4.187 kJ/kgK,

SF - 90 Total No. of Pages :4

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T.E. (Mechanical) (Part - III) (Semester - V) (Revised) Examination, November - 2017 MACHINE DESIGN - 1 Sub. Code: 66244

Day and Date :Monday, 20 - 11 - 2017 Time (10.00 n.m. to 1.00 p.m.

Total Marks : 100

1181

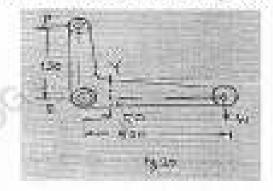
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Instructions:

- 1) All questions are compulsory.
- 21 Figures to the right indicate full murks.
- Make suitable assumption wherever required and state them clearly.
- Use of non-programmable calculator is permitted.
- 5) Draw agai diagrams wherever accessory.

Q1) Solve any Three:

- Summarize material selection procedure adopted for designing a machine element.
- Name different theories of failure. Illustrate the use of theory of failure for brittle material.
- Explain the design procedure for a turn-buckle with the help of neat sketch.
- Write a note on design of bolted joints with load perpendicular to the axis of bolt.
- Q2) a) A bill crank lover to raise a vertical load is shown in fig 2a. The vertical load to be lifted is 4500N. The lever consists of forged steel innertial and a pin at the fulcrum F. Assume following data for the lover material. Safe stress in tension = 75 MPa; safe stress in shear=60MPa; safe benring pressure on pins=10N/mm². Determine the pin diameter at end P, dimensions at F and cross section Y-Y (near to fulcrum) [8].

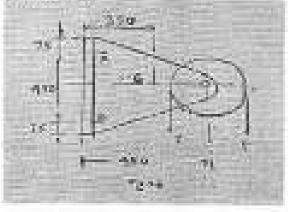


SF - 90

161

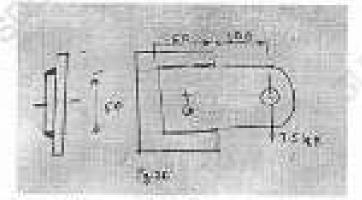
b) Figure 2b shows a pulley bracket, which is supported by 4 bolts, two at A and two at B. The weight of pulley and bracket. W is 1850N, and the boad, F on the rope is 20kN.

Determine the size of the boits, using an allowable shear stress of 40 MPa for the bolt material. [8]





c) A welded connection as shown in figure 2c is subjected to the eccentric force of 7.5 kN. Determine the size of welds if the permissible shear stress for the weld is 90%/mm². Assume static conditions. [8]



- Q3) a) Discuss the design precedure for square key.
 - b) A splined connection with the following particulars is used for a genr and shaft assembly in a genr box. The power to be transmitted is 20kW at 240 r.p.m. The bearing pressure on the splines is limited to 6.5.MPu during sliding. The coefficient of friction is 0.1 [10] Major diameter = 60mm Minor diameter = 54 mm

withor diameter = 54 min

Number of splines - 10

Determine (i) The length of gear hub

The force required to shift the gear.

OR.

 e^{2e}

1101

c) Design a cast iron protective type flange coupling to transmit 15 kW at 900 np.m. from an electric motor to a compressor. The service factor may be assumed as 1.35. The following permissible stresses may be used:

Sagar stress for shaft, bolt and key material =40MPa Crushing stress for bolt and key = 80 MPa Shear stress for cast iron = 8 Mpa Draw a neat sketch of the coupling.

- Q4) a) What are the various types of springs used in practice? Explain one application of each. [6]
 - b) Design a close colled helical compression spring for a service load ranging from 2245N to 2745N. The axial deflection of the spring for this load range is 6mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity is 84kN/mm³. Assume squared and ground ends for coil. Neglect the effect of stress concentration. Draw fully dimensioned sketch of the spring.

Std. wire gauge (SWG) number and corresponding diameter of spring wire is given in the following table. [10]

SWG	6/0	\$10	4/0	3.0	2.0
Diaminm	11.785	10.973	10.160	9,490	8.3.39

Q5) a) Derive an expression for maximum efficiency for square threaded screw.[6] OR

What is recalculating ball screw? Explain with next sketch,

[b] The power transmission surew of a screw press is required to transmit maximum load of 100 kN and rotates at 60 RPM. The trapezoidal threads are to be used as under:

Nominal Dia.mm	-40	50	60	:70
Core Dia.mm	32.50	41,50	\$0.50	59,50
Mean Dia.mm	36.50	46,00	55.50	65.00
Core Area mm ^T	830	1353	2003	2781
Pitch mm	7	8	9	10

The screw thread friction coefficient is 0.12. The torque required for collar friction and journal bearing is about 10% of the torque to drive the load considering screw friction. Determine screw dimensions and its efficiency. Also determine the motor power required to drive the screw. The maximum permissible compressive stress in the screw is 100 MPa. [12]

SF - 90

- Q6) a) Explain the step by step procedure for selection of V- belt from Manufacturer's Catalogue, [6]
 - b) It is required to select flat belt drive for a fan running at 360 rpm which is driven by a 10kW 1440 rpm motor. The belt drive is open type and space is available for a center distance of 2 m approximately. The belt should operate at velocity between 17.80 m/s to 22.90 m/s. The power transmitting capacity of the belt per mm width per ply at 180° are of contact and at a belt velocity of 5.08 m/s is 0.0118 kW. The load correction factor can be taken as 1.2. Suggest preferred pulley diameters for the motor and fan pulleys and give complete specifications of belting. Refer the tables given below.

Are of Contact Factor (F_)

Ø _y (Deg)								
P	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.94

Standard Widths of these belts in mm

3-Ply	25	48	50	-63	76				1	23
4 Ply	40	44	50	63	76	-90	100	112	125	152
5-Piy -	76	100	112	125	152		- 54	ste		
6-Ply	112	125	152	180	200			391		

For flat pulleys: Series of preferred values of pitch diameters (in mm) series follows.

Pitch diam	sater (mm)	125	132	140	150	160	170	180	190
200 212	224	236	250	265	280	300	315	355	373
400 425	450	475	500	530	560	.600	630	670	710
750 800	900	1000							

Ballison

SF - 91 Total No. of Pages : 3

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T.E. (Mechanical) (Part - III) (Semester - V) (Revised) Examination, November - 2017 MANUFACTURING ENGINEERING Sub. Code : 66245

Day and Date : Wednesday, 22 - 11 - 2017 Time : 9.30 a.m. to 1.30 p.m. **Total Marks: 100**

Instructions	13	All quistions are compaisory.

- 2) Figures to the right indicate fall marks.
- 3) Assume if necessary suitable data and state them clearly.
- Use of non-programmable calculators is permissible.

SECTION - 1

Q1) Solve any two:

- Explain with neat sketch the types of milling cutters.
- b) Derive an expression for Shenr strain.
- c) In an Orthogonal carting of the material, Cutting force (F₀) =138Kg. Feed force (F₁) = 68Kg, Rake angle (α) =7°. Chip thickness ratio (r) = 0.4. Determine
 - i) Coefficient of friction of chip
 - Shear force (Fs) and normal to shear force (Fn).
 [8]

Q2) Solve the following questions.

 Define machinability. Explain the factors affecting machinability. How the machinability index is defined?

OR:

a) Explin concept of wear & types of wear with sketch.

b) Determine

ETO

181

183

181

- Taylor's Tool life equation
- Cutting speed for 6 minutes of tool life when tool life of 70 minutes is obtained at a speed of 25m/min and 15 minutes at 40a0min.

Q3) The component shows in fig. is to be processed on a single spindle automat. Study the component and prepare: [18]

- a) Detailed process sheet
- b) Tool Layout

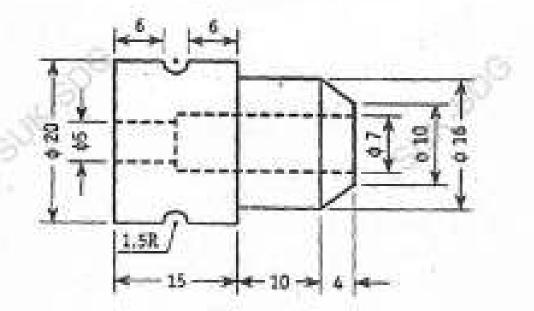
Ð,

- Cam profile for drilling operation-of 05 mm hele through.
- d) Calculate Production rate per hour

Moterial - \$ 20 Bronze bar

All dimensions are in num,

SF = 91



SECTION - II

Q4) Design & draw near dimensional drawing in three views with one sectional view of jig for drilling two holes \$12 in the given bracket as shown in figure. [26]

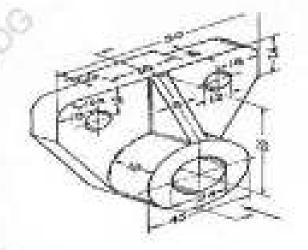
ØR.

Design & draw neat dimensional drawing in three views with one sectional view of Milling fixture for creating plane surface of \$\$\$ 24mm of the given bracket as shown in figure.

[12]

W.SO

Also Justify the selection of location, clamping & guiding elements.



Q5) Attempt any two.

a) Explain with next sketch the Compound die. [6]
b) Explain types of Stock stop. [6]
c) Explain the importance of following in Press working [6]
i) Strippers
ii) Clementer

Q6) Write short notes any three.

- a) Construction & working of CNC.
- b) Automatic Tool Changer.
- c) CNC axes and drives.

WK-50G

d) Modular Tooling System.



-3-

SF - 987 Total No. of Pages : 4

Seat. No.

T.E. (Mechanical) (Semester - V) Examination, November - 2017 CONTROL ENGINEERING

Sub. Code : 66241

Day and Date : Thursday, 69 - 11 - 2017

Total Marks : 100

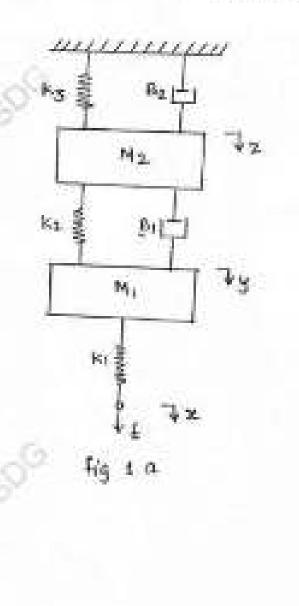
Time : 10.00 a.m. to 01.00 p.m.

lastructions : 1) All questions are compulsory.

2) Figures to the right Indicates full murda,

5) Assume any additional data if required and mention it clearly.

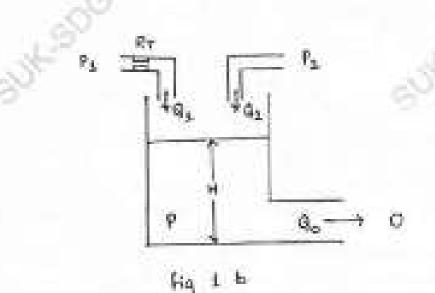
(Q1) a) For the mechanical system shown in Fig. 1 a, prepare grounded chair representation and construct electrical circuit using force current analog [6]





SF - 987

b) For the fluid system shown in Fig. 1b, determine equation of P1 in terms of P2 and P
 [6]
 [6]



c) For the thermometer shown in fig. 1c, the ambient temperature is Ts and temperature of fluid is T. The rate of heat flow from surrounding medium to the fluid is Q = C₂(Ts + T) The rate of change of temperature of fluid is D T = C₂ Q construct the block diagram representation for the system in which Ts is input and T is output. Determine time constant. [6]

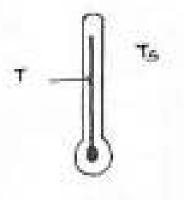
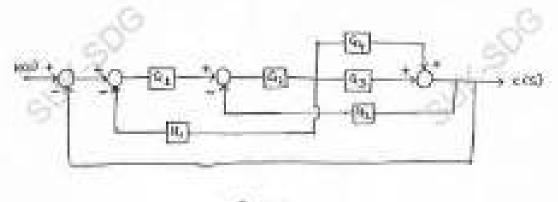


Fig 1C

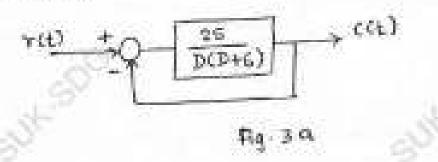
Q21 a) Determine linear approximation for the equation Z = sinX, cos Y for Xi = 60° and Yi = 30°. What is approximate value of Z when X = 63° and Y = 28°.
[8]



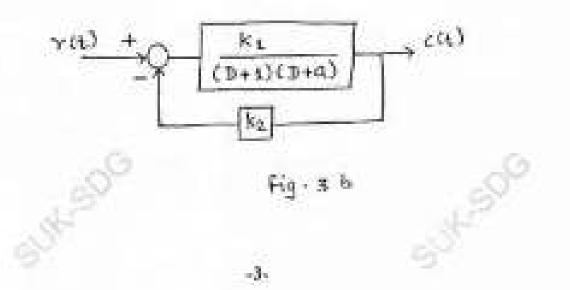
b) Reduce the block diagram shown in fig. 2b and obtain transfer function [8]

Fig. 2. b.

Q3) a) A hydrautic control system is shown in fig. 3a. The forcing function is r(t) = u(t) and all initial conditions are zero. Determine the response c(t) of system.



b) For the control system shown in fig. 3b, determine K₁, K₂ and a such that the system will have a stendy state gain of 1, a natural frequency of 2 and damping ratio of 0.5.



(24) a) Sketch root locus plot (b) $G(S) H(S) = \frac{K}{S(S^2+6.S+12)}$ [12]

- b) A unity feedback control system is having an open loop transfer function $G(S) = \frac{K(S+13)}{S(S+3)(S+7)}$ Determine the range of values of K for the system to be stable. [6]
- Q51 a) Sketch the Bode plot for the transfer function $G(S) = \frac{1000}{S(1+0.1,S)(1+0.001,S)}$ Determine gain margin, and phase margin. [10]
 - b) Calculate break in point and angle of departure for the ocertral system, given by characteristic equation S² + 2S + 3 + K (S + 2) = 0. [6]
- (26) a) The motion of a numerically controlled machine tool is described by the differential equation 9 + 7.3 + 10.3 = f(t). Determine computer diagram and state space representation using parallel method. [8]
 - b) The motion of robot irm controlled by an electric motor is given by the differential equation y + 6, y + 9, y = f(t). Use series programming to determine computer diagram. [8]

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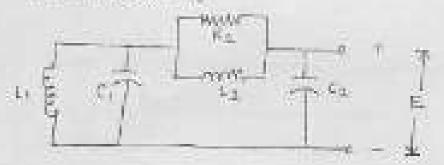
SJ-326 Total No. of Paper 1

T.E. (Mech.) (Semester - V) (Revised) Examination, November - 2016 CONTROL ENGINEERING Sub. Code : 66241

They and Dote : Wednesday, 16-11-2016 Time : 2.39 p.m. is 5.39 p.m.

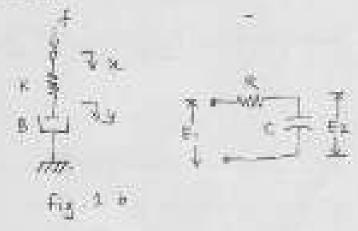
Total Marks: 100

- Instructional ().
 - All quarties investigations
 - It should warrants data what every required and mention it shouly-
 - 3. Figures to the right indicate field marks.
- Q2) a) For the electrical network shares in fig. 1a, construct receivering system using finite content analog: [6]

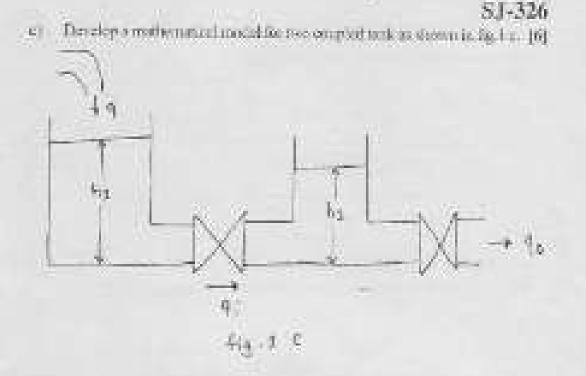




 b) Show that the mechanical and electrical system abown in fig.1 h are analogous system.

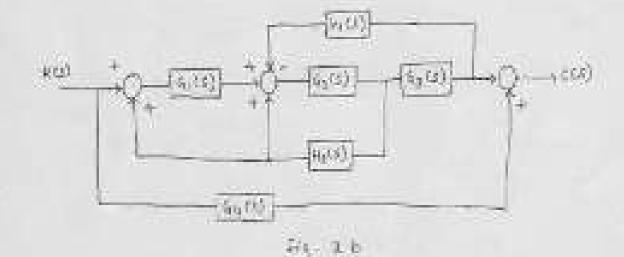


RTO



Q2) at For subscore flow of air through a costriction, the mass flow new is M = 1.05 A $\sqrt{\frac{(P_s - V_s)}{T}}P_1$. The new A and temperature T are constants. Determine the linear approximation for mass flow rate [8].

b) Reduce the block diagram mown in Fig. 2 b and find immedie function.[8]



*

(Q3) a) For the unity feedback control system, shown in fig. 3a, collarized value of k₁ so that system is utilically dimped. Also extended maximum overshoot and settling time.

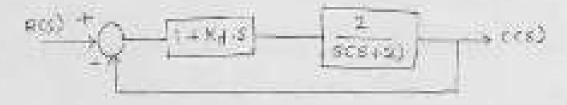
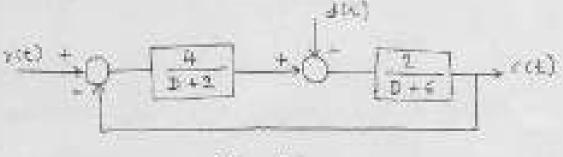


Fig. 3 a

 b) A.D.C. position control system is show in fig.10. Determine the response c(r) for o(t) = 0 and all initial conditions are zero. [8]



69.36

Q41 a) Using Rootly stability unter any investigate the stability of a unity feedback control by seein whose open loop transfer function is given by

$$G(S) = \frac{K e^{-t}}{S(S^{2}+2S+9)}$$

(6)

b) Skatch next focus for system having -

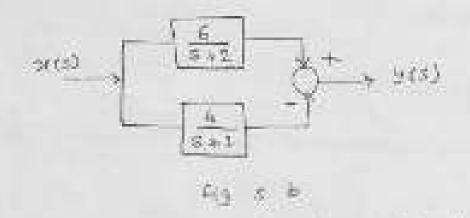
$$\pi(S)\Pi(S) = \frac{K(S^{2} - 1.S + 29)}{(S+2)(S+4)}$$
[10]

3

(05) a) Drive the hode plot for the unity Stellenck control system with

 $G(S) = \frac{10(S+10)}{S(S+2)(S+5)}$. From the plot determine values of gain margin and phase margin. [12]

(b) Obtain y(t) when u(t) is a unit also for the system shows in fig. 5.3: [6]



Q6) a) Determine data space representation and computer diagram by turing programming for the differential equation.

$$(D^{1} + 3D = 2)\gamma(t) = (D + 3)(0)$$
 [8]

 For the differential equation (D¹/1.9D² + 34S + 20) y(t) = (D+3) i(t), determine state space representation and computer diagram by general programming. [8]

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51-327 Total No. of Pages : 4.

T.E. (Mechanical Engineering) (Part-I) (Semister-V) (Revised) Examination, November - 2016 THEORY OF MACHINES-II Sub. Code: 66242

Day and Hats ; Samering, 19 - 31 - 2010. Time 12.30 p.m. tr 5.39 n.m.

Total Marks ; 100

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- 240 Figures to the right indicate fail matter.
- Drate must hits first shrink whatever increases \mathbf{n}
- 31 Assures Concessory so in Me days and then clearly. 21
- Use of Nun programma his calculator is parality 4.
- OF5 al. State and detive the law of Genergy,

1100

OB.

Dallaremate between hypolate and Cyclosed much proving and defice the fellimeng termi

- Pressure angle. 86
- 100 Citral action.
- b) A pair of scars, having 40 and 30 with respectively are of 25° mediate from. The addendum length is 5 mm and modele mich is 2.5 mm. If the number wheat is driver and rousing at 1550 area. Find the velocity of adding at the point of engagement and at the paint of discognigement.

trop

161

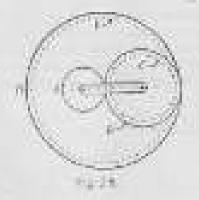
021mClassification of Geartrain.

OB

Explain the concept of pourvolent many and montrest of inertia applied for your triates

117.0.

- SJ-327
- *1 Fig. 2 by bown an epicyclic gata min. Pinion A has 15 yeth and is shald y fixed in the costor shall. The wheel B has 10 theft and genu with A, and shown it annals: fixed wheel D. Persen C has 15 tests and is integral with B (C, B being a compound gate wheel). Gate C inestes with annalise obset E, which is keyed to the machine shoft. The sum rototes about the same shall on which A is fixed and entries the compound wheel B. C. If the name wheel B and on which A is fixed and entries the compound wheel B. C. If the name we at 1400 spit, that the event of the machine shoft. Fixed the torque executed with machine shoft if aution develops a torque of 100 km.



- Q51 as Condition for staff big of two wheel values moving in a curved path and
 - (b) An acceptance makes a complete ball circle of 50 m radius, towards left, when flying at 200 km per hour. The entry orgine and the parpeller of the plane has a mass of 450 kg with a radius of genetics of 300 km. The orgine num at 2400 epise clockerise, when viewest from the real Final the generative plane is a set if and state the attractive of it. What will be the effect, if the acceptance turns to its right instead of in the tail? [10]
- (Q4) a) Device the equation for correction couple to be applied to make two mass system dynamically sprivatest, [8]

OR.

- 64

Derive an unpression for writerity and acceleration of the different much

- b) A variant english motor graf 1290 rpm with a struct of 110 mm, has a connecting rold 250 mm between volume and nature of the connecting rold is man. (25 kg. The mass parties of the connecting rol is 74 mm from the big and centre and when suspended from the golgeon pin rols makes 21 oscillations in 20 separate. [10]
 - Calculate the multiplic of gynetion of the connecting sort about an asla strong to many scenario.
 - E: When the cruck is st #0° from the top dead centre and the pionen is moving downwards, fortherally ically, the use electric of the pionen in and the angular acceleration of the connecting red. Hence first the interim forque counted on the cruck shaft. To essive the two mass system to be dynamically equivalent to the connecting rod, necessary connected to open has to be applied and since the angine is vertical, gravity offect are to be considered.
- QSI v) Explain white its multi-cylinder inline engine. Also explain conditions to hime prior any and secondary linear and counter manifold in multi-cylinder unline engine. [6]

08

Explain the balancing of several movem couping to serme plane.

- b) The crafts and the constanting cost of a 4-cylinder instanz engine matring in 1800 mp more 60 mm and 2041 mm each respectively and the cylinders are specied 1991 mm apart. If the cylinders are remained 1 to 4 in sequence from one end, the statics appear at intervals of 90° in an end steve in the order 1-4/2/3. The orbits appear at intervals of 90° in an end steve in the order 1-4/2/3. The orbits appear at intervals of 90° in an end steve in the order 1-4/2/3. The orbits appear at intervals of 90° in an end steve in the order 1-4/2/3. The orbits are more three possible to end of 910° in an end steve in the 1.5 kg Determine: [112]
 - p Dubalanced primary and secondary locces, if any, and

13.0

10 United primary and secondary couples with reflected to control place of the organization.

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Total No.	úť.	Рáў	en i	4

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T.E. (Mech.) (Part - HI) (Semister - V) Examination, November - 2016 HEAT AND MASS TRANSFER Sub. Code : 66243

Day and Hate | Tuesday, 22-11-2016 Time (2.30 p.m. to 5.30 p.m.

Tatai Marks (100

instructions: 15

- All questions are essentition.
- 22 Figure to the right indicates full search.
- 2) Assume mitable data who never Necessary and State II clearly.
- 4) Use of specific coherdators is parentified

Q11 Solve my three:

- Define estimat radius of insolution. Also derive the equation for critical station of insolution for ballow cylinder.
- b) Explain the different modes of mass prinster. Explain with statistic exceptes. [6]
- c) A 0.5 m high and 1.5 m while double parts window consist of two 4 mm thick layer of gines (k = 78 W/mK) separated by 10 mm wells staprimi are space (k = 0.0600 W/mK). Determine the nate of best matcher torough this window when soom in maintainest at 29% and rounde our is at -10%. Take comobility has transfer coefficient as 10 and 40 W/m/K.[6].
- d) An aluminant pipe carries a stand at 110°C. The pipe (k = 185 Wink) has a inner diamone of 10 cm and outer diamone of 12 cm. The pipe is broated in a summ where the ambient at itemportate is 30°C and convective best transfer coefficient to 13 Win/K. Determine beat transfer may per unit length of pipe. Neglect convective best transfer on scenario side. [6]

 ETO_{i}

Q2) Solve my two:

- Derive expression for temperature distribution of a solid cylinder generating heat of the case of 47 unit certain solume. [8]
- Explain Lumpeditezt capacity analysis. Also give the physical significance of Fourier's combar. [8]
- a) A solid copportsphere of 10 cm diameter (p = 8954 lasted, C = 381)/ lasted = 386 WinK's initially at onitions temperature 250°C, it suddenly incorrected in a fluor which is traintained at uniform temperature of 60°C. The heat massfer coefficient between sphere and fluid in 200 Winr'K. Determine the temperature of copper sphere at 5 minutes after immersion. [8]

Q3) Solve any two:

- Derive an expression for temperature distribution along the length of a pio fin having insulated tip.
- b) A 1 m long, 5 cm diameter cylinder placed in an atmosphere of 40°C is provided with 12 first (k = 75 Winte), 0.75 run thick. The first protodes 2.5 cm from the estilation surface. The heat transfer coefficient is 23.3 Wintek. Calculate the rate of heat usually if the surface temperature of cylinder is a 150°C. [8]
- c) Determine thermal conductivity of long solid 2 cm diameter real, one end of a rod is interted in a formore while remaining portion is projected out in nir at 30°C. After steady state has been reached, the temperatures at two points on the rod which are 10 cm sport are massined and found to be 120°C and 90°C respectively. If coefficient of heat morefar in 20 WmFR, What will be thermal conductivity of the rod?⁹ [8]

Q4) Solve any drive of fair following:

99	Analyze the problem of forced convection by using climensional analysis		
	wednigur.	[5]	
þ)	Write a short rate on dontal boundary layer.	[5]	

-2-

51-328

- (c) A vertical cylinder 2m high and D1 cm in clameter is maintained at a temperature of 100°C internationsphere of X2°C. Calculate Ωm heat lost by four constants from this cylinder. The properties of sir n 60°C and p = 1.06 kg/m³/ Cp + 1008 Mkg K, k = 0.028 WimK, μ = 20 × 10° N sector³, v = 58.9°C = 10° m³/sec. The the correlation Na = 0.12 (Gr.P1)⁻⁰. [8]
- (d) 0.5 Spinitude of water is heated from 20°C to 40°C by passing through a treed pipe of 2.5 cm diameter which is maintained at 110°C, floid the length of the pipe corpliced. The properties of water are ρ = 978 kg/m². Up= 4200 0 kg/S, k = 0.575 WestK, ν = 0.415 × 10° m/sec. Use the correlation Na = 0.023 Be^(a) P^(a) for nubriest flow and Na = 0.65 in the flow is harmone. [9]

Q5) Solve Any these of the following:

- Store end explain Planks law. [6]
- (b) What use the various theories of cadiation heat transfer? [6]
- The temperature of a flatter in the forensec is 1990 K. Find Menochromatic entities a prover of the maximum wavelength.
- 4) Determine the heat lost per mater singlit of 8 cm diameter tobe at 300°C located in a large from with resibilities walls at a temperature of 27°C. Accume emissivity of pipe as 0.79. [5]

Q6) Solve Any three of the follow and

- a) Derive the expression for fiffectiveness for parallel flow hert excitanger [6]
- b) Define the following terms in connection with hest exchanges: [8]
 - 0 LAND
 - i) NUL
 - Effectiveness
 - ie) Correction foctor
- Write a short note on design considerations of heat exchanger. [5]
- b) Write a short note on Novelt's theory of film wise condensation. [5]

Total No. of Pages : 4

Seat No.

T.E. (Mechanical) (Part - III) (Semaster - V) (Pre-Revised) Examination, November - 2016 MACHINE DESIGN -1 Sub, Code : 66244

Day and Date : Thursday, 24 - 11 - 2016 Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

- Instructions : 1) All quantum are compaisery.
 - 21 Tripures to the eight indicate full marks,
 - 3) Make suitable assumptions wherever required and state them exartly.
 - 4) Use of non-peoplan mable extention is provided.
 - 5) Draw near disgrams wherever naisessary,

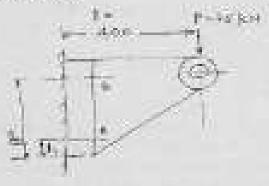
Q1) Soble any Three

[18]

- a) State and explain the varieus steps involved in design of a machine element.
- b) Suggest with justification the suitable material for the following,
 - Leaf Spring in sutomobile
 - i) Intiched
 - ii) Heimet (Two whenter)
- Explain the design procedure for a knuckle joint with the help of next skritch
- d) What is a heat weld joint? Diseases design of built would joint under tension.
- (Q2) a) A turn-buckle med for a stay rope of an electric post subjected to a firste of 15 kN. The permissible tensile stress for the steel rods used is 70 MPs. The permissible biosile and shear stress for the cast iron on used is 30 MPs. Design the turn-buckle. [8]

PTO.

(b) A cast iron bracket fixed to the steel structure is shown in figure 2a. It supports load P of 25 kN. There are two belts at A and two belts at B. The distances are as follows: 1, = 50 mm 1, = 300mm 1 = 400mm. Determine the size of bolts, if movement permissible tensile stress in the bolts is 50 N/mm².

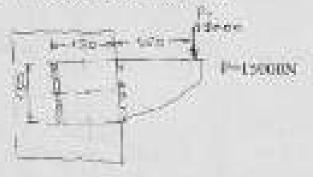


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ALC: NO	ALC: NO		100
			1010

Designation	Pitch (mm)	Major or Nommal disander (mm)	Minor or Core diameter (com)
MBO	1.50	30	25.706
3436	4.00	34	31,093
M642	4.50	42	36,479
M48	\$ 60	48	41.866

OR

b) Figure 2b shows a plate bracket worlded to a steel column, and loaded eccentrically. Assuming that the slar of world is form > 0mm, determine the maximum stress induced in the world.



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1.20

[6]

Q3(a) Discuss ASME code for shaft design

b) Design a shaft to transmit power from an electric moments a labe head stock through a pulley by means of a horizontal belt drive. The polley weighs 20 kg and is located at 100 mm from the center of nearest hearing. Diameter of the pulley is 200 mm. Maximum power transmitted in 1.1 KW at 120 mp m. Angle of lap of belt is 180° and the coefficient of fliction between the belt and dulley is 0.3. Shock factors in bending and horizon ary 1.5 and 3.0 respectively. Allowable sheet stress in the shaft is 35 N/am³. The pulley is mounted over hous on the shaft. [10]

OR:

- b) It is required to design a rigid type of flange coupling to connect two shafts. The input shaft transmits 37.5 kW power at 180 rpcm, to the output shaft through the coupling. The design torque is 1.5 times the tured inspire. The material for shaft is 4008 (S_g = 360 N/mar², factor of sufety = 2.5), material for key = 300.8 (S_g = 460 N/mar², factor of safety = 2.5), material for flange FG 206 (S_g = 200 N/mar², factor of safety = 6 haved on ultimate strength).
- Q4) a) Herive un expression for deflection of holical spring of circular wire [5].
 - 51 Design a close coiled belied compression apong for a service lead ranging from 2245N to 2745N. The axial deflection of the spring for this load image is 6 mm. Assume a spring index of 5. The permissible shear attess intensity is 420MPe and modulus of rigidity is 84kNimm². Assume squared and ground ends for coil. Neglect the offset of stress concernation. Deaw fully dimensioned sketch of the spring. [11]

Std. wire gauge (SWG) number and corresponding diameter of spring wire is given in the following table.

SWG	60	50	4.0.	3.0	2.0
Diam run	11.785	10,973	10,160	9,490	8.532

Q5) ii) Derive on expression for tanger impaired to raise the load using square threaded screw. [6]

88.

 Discuss Various forms of threads used for power transmission giving their relative merits and limitations.

CONTRACTOR OF	10 C	201 (201)
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10000	Line Che-	200 B. B.
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Total No. of Pages 13.

T.E.(Mechanical Engg.) (Semester - V) (Revised) Examination, November - 2016 MANUFACTURINGENGINEERING Sub. Code :66245

Day and Date (Saturday, 26+11-2016) Time : 2.30 p.m. 16 4.30 p.m.

Total Marks : 101

- Instructions: All questions are compulsory. Ð.
 - Figures to the right indicate full rearies. 2i
 - Assume if trecessary suitable data and state there clearly. 331
 - Use of non-programmedble calculator on permissible. 63

SECTION-I

OD Sciencery pro-

Seal.

No.

- Derive an expression for Shear steain. Store clearly the assumptions 181 made. [8]
- b) Explain with ceat sketch the types of century,
- In an Orthogranal putting of the material, Cutting force (F.,)=).50kg, Food 10 force (F.) =80kg, Robe angle (a)=8°, Chip thickness ratio(r)=0.3.Detention 7) Shear force (Fs) and notical to allear force (Fin) ii) Coefficient of friction of chire. 80.

QZJ Solve the following questions.

Explain concept of weer & types of weer with scench. 83. 181

OR

Define machinability Explain the factors affecting machinability. How 101the machinability index is defined? [8] I

またの。

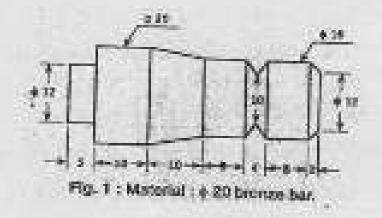
181

- b) A Tool I-Te of 60 minutes is obtained at a speed of 20m/min and 16 minutes at 40m/min.Determine
 - 0 Taylor's Tool life equation
 - Cutting sport for 3 minutes of tool life.
 [8]

2.97 The component shows in fig. is to be processed on a single spindle automat.Study the component and prepare: [18]

- Detailed process sheet
 b) Tool Layout
- (c) Cara profile for orilling operation d) Calculate production rate per hour-

Material -5 20 Bronze bar. All distensions are in mm.



SECTION-II

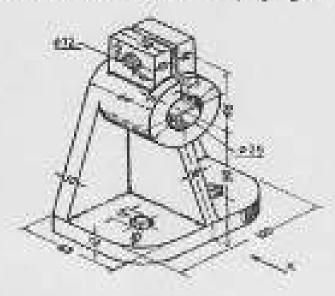
Q40 a) Design & draw non-dimensional drawing in three views with one socional view of jip for deilling two holes (+12 in the "bottom plate" of this given bracket as shown in figure. [26]

OR:

124

Design & drawn and dimensional drawing to three views with one sectional view of milling fixture for evening slot of 3mm of the gives Interest as abown in figure.

Also justify the selection of location, champing & guiding elements.



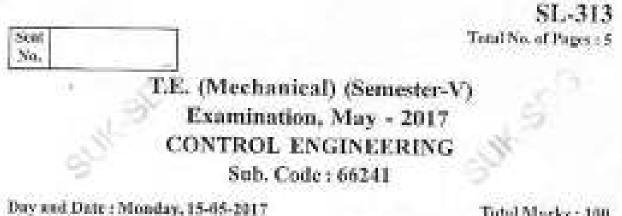
[25] Solve any two.

6]	Explain the importance of following in pross working	141
	i) Surippers	1997
	i) Clearance	
70	Expann with near sketch the progressive die.	[6]
¢)	Explain types of stock stop,	[6]
26 W	ite short notes on any three	[32]
43	Distant Locator.	110000
bj	Automatic Tool changes,	
43	Modular tooling system.	

 $\overline{0}$ Strip luyour.



and a s



Time : 10.00 a.m. to 1.00 p.m.

Total Marks : 100

Instructions :

- 15 All questions are caminglacey.
- Assume any additional data if expaired and mention it clearly. 20
- 35. Figures to the right indicate full marks.

For the mechanical system shown in fig.1a, construct grounded chair (0.160)representation and electrical network using force current analog. [6]

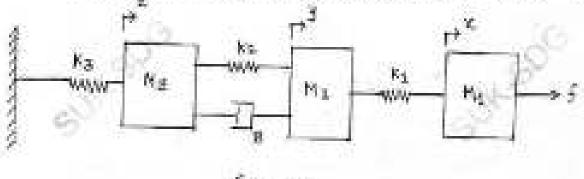


fig 1 a

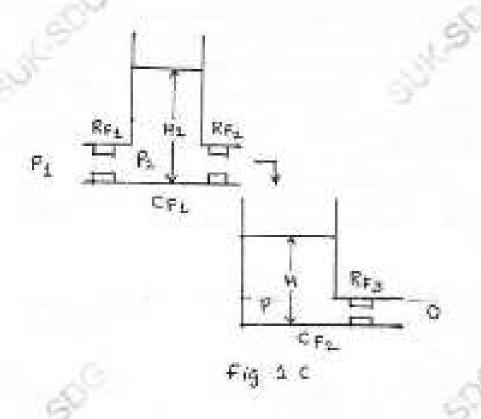
訪. A block of material at temporature T is placed in an oven which is held at the constant temperature T.. The rate of heat flow a into the material is given by $q = hA(T_1 - T)$, where h is the coefficient of heat transfer of the surface. A is the area of the surface and T is the temperature of the

block. The rate of change of temperature of the block is $\frac{dT}{dt} = \frac{q}{MC}$. where M is the mass and C is the avorage specific heat. Determine the differential equation which describes the temperature of the block as a function of time. Identify the time constant,

66I

SL-313

 For the fluid system shown in fig.1c, determine the equation for pressure P (head H = P/p) as a function of inlet pressure P₁.
 [6]



Q2) a) For subsonic flow of air through a restriction, the mass flow rate is given by, $M = 1.05A \sqrt{\frac{(P_i - P_i)P_i}{\tau}}$. The area of restriction A and the temperature

T are constants. Determine the litear approximation for mass flow rate due to change in pressure drop $(p_1 - p_3)$ and due to a change p_4 in the downstream pressure. [8]

b) The speed torque curves for a dc motor are shown in fig. 2.1b, where V is the upplied voltage, N is the speed and T is the output torque. Determine the linear approximation for the change in torque t due to a change in speed n and a change in voltage v. The motor drives as inertial load such.

that $l = J \frac{dt}{dt}$, where J is the mass moment of inertial For J=0.1, determine the differential equation relating the change in speed n to the change in voltage v. Determine the time constant t and the steady state gain. [8]

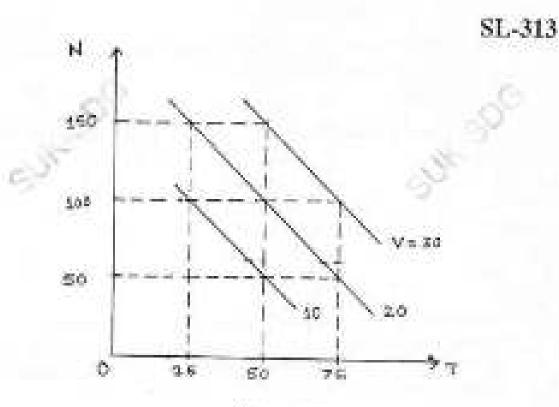
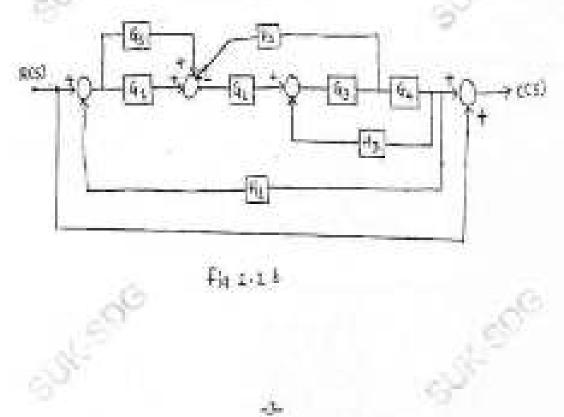


Fig. L.d. b

CIR.

Reduce the block diagram shown in Fig 2.2b and find transfer function.[8] b



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Q3) a) For the system shown in fig. 3a, find K and K, so that maximum overshoot is 10% and settling time is 0.05 sec. [8]

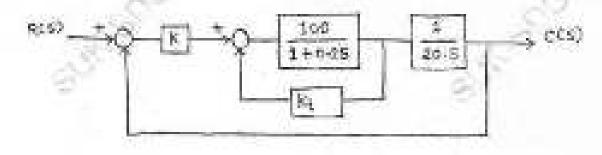
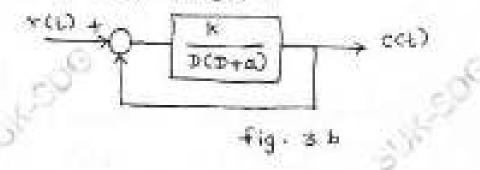
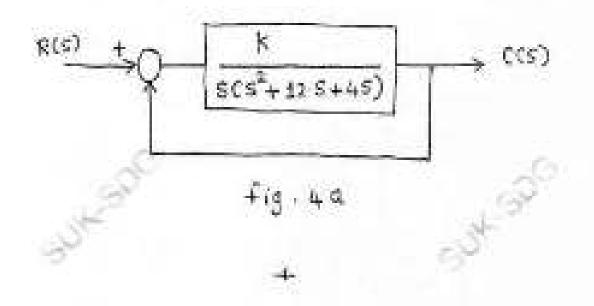


Fig. 3 a

b) For the integral control system shown in fig. 3b, determine the value of K and a, such that the characteristics equation has a real root at - i and a real root at - 5. For this value of K and a, determine the response c (t) when r (t) = 0, c {0} = 4 and C(0) = 0. [8]



Q4) a) Block diagram for helicopter subilizing system is shown in fig.4a. Construct root locus plot for this system. [12]



SL-313

 b) For the system shown in fig.4b, determine the range of values of K such that the system is stable.

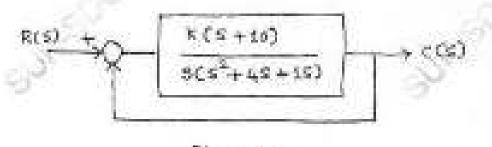


Fig. 4 b

- Q5) a) Explain the following terms.
 - Lead compensator.
 - i) Lag compression
 - iii) Lag-Lead compensator

10

- b) Sketch Bode plot for $G(S) = \frac{1}{S(S+1)(S+5)}$ with unity feedback. [10]
- Q6) a) The motion of a driverless vehicle is described by the differential equation

$$f(t) = \frac{2(D+5)}{(D+2)(D+3)} f(t)$$

Determine the computer diagram and stata space representation by

- i) Series programming
- il) General programming.
- b) For a unity feedback system with an open loop transfer function

 $G(S) = \frac{n}{S(S+2)(S+4)}$ find break away point and intersection of root locus with integrary axis. [8]

[6]

 $\{8\}$

SL-314 Total No. of Pages : 4

Seat Nu.

> T.E. (Mechanical Engineering) (Part - I) (Semester - V) (Revised) Examination, May - 2017 THEORY OF MACHINES - II

Sub. Code : 66242

Day and Date : Tuesday, 16 - 65 - 2017 Time : 10.00 n.m. to 1.09 p.m.

Total Marks : 100

PTO

Instructions (.1) All questions are compalsary.

- 2) Figures to the right indicate fall marks.
- 3) Draw next labeled should wherever necessary.
- 4) Assume if necessary suitable data and state it clearly.
- 5) Use of Non-programmable calculator is permitted.
- Q1) a) State velocity of sliding and prove that the velocity of sliding is proportional to the distance of the point of contact from the pitch point [8].

GR.

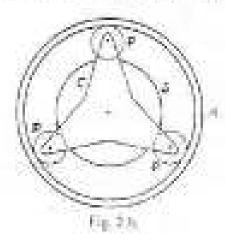
Derive an expression for minimum number of teeth required on pinion to avoid interference in mesh with gear.

- A 20° involute pinion with 20 teeth drives a 50 toeth gear. Module is 8 mm. The contact ratio is to be associated without interference. Find the two addenda, length of are of contact and connet ratio. [10]
- Q2) a) How the velocity ratio of epicyelle gaur train is obtained by tabular method. [6]

OR

Write a note on Inertia geared system.

b) An epleyelic gear train for an electric motor, is shown in Fig. 2b. The wheel S has 15 teeth and is fixed to motor shaft rotating at 1450 rpm. The planet P has 45 teeth, gears with fixed sumular A and rotates on a spindle carried by an ann which is fixed to output shaft. The planet P also gears with the sum which is fixed to output shaft. If eactor is transmitting 2 HP, find the torque required to fix the remain. [10]



(Q3) a) Draw Gyroscopic couple figure and define the following terms: [6]

- Axis of Som
- i) Precessional angular motion

iii) Axis of Precession

- b) The turbine rotor of ship has a mass of 900 kg and radius of gyntion 600 mm. It rotates at 1800 rpm clockwise when hooking from the stern. Determine the gyroscopic couple when: [10]
 - The ship is envelling at 40 km/hr and steers to the left in a curve of 100 m radius and its effect;
 - (ii) The ship pitching and the how is descending with montimum volocity. The pitching is simple humanic, the periodic time being 30 seconds and the total angular moment between the extreme positions is 1.2⁴.

-27

Q4) a) Derive an expression for angular velocity and angular acceleration of the connecting rod. [6]

OR:

Derive the equation for correction couple to be applied to make two mass system dynamically equivalent.

- b) The connecting rod of a gasoline engine is 300 mm between its centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg - inm⁴. Its centre of gravity is at 200 mm from its small end centre. Determine the dynamical equivalent two muss system of the connecting rod if one of the musses is located at the small end centre. Ut01
- Q5) a) Explain primary and secondary unbalanced forces of reciprocating masses. Write the maximum values of these forces and the position of the crank at which these maximum values occur. [6]

OR

Explain partial helancing of unbolanced primary force in a reciprocating engine.

- (b) A shuff carries four masses in parallel planes A, B, C and D in this order along its length. The masses at B and C are 18 kg and 12.5 kg respectively, and each bas an eccentricity of 60 mm. The masses at A and D have an eccentricity of 80 mm. The angle between the masses at B and C is 100° and that herwean the masses at B and A is 190°, both being measured in the same sense. The scial distance between the planes A and B is 100 mm and that between B and C is 200 mm. If the shaft is in complete dynamic balance, determine: [124]
 - The magnitude of the masses at A and D;
 - iii The distance between planes A and D; and
 - ii) The angular position of the mass at D.

- Q6) a) Derive the expression for unsile or hoop scress due to centritugal force in flywheel rim. [6]
 - h) A multi-cylinder engine is to run at a speed of 600 rpm. On the wing the isothing moment diagram to a scale of 1 mm = 250 Nm and 1 mm = 3°, the areas above and below the mean torque line in mm² are:

#160, +172, +168, -191, +197, -162. The speed is to be kept within ± 1% of the mean speed of the engine. Calculate the necessary moment of inertia of the flywheel. Determine the saitable dimensions of a rectangular flywheel dim if the headth is twice its thickness. The density of the cast iron is 7250 kg/m² and its hoop stress is 6 MPa, Advance that the rim contributes 92% of the flywheel efforts. [10]

SL-315 Total No. of Pages : 4

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T.E. (Mechanical) (Part-III) (Semester-V) (Revised) Examination, May - 2017 HEAT AND MASS TRANSFER Sub. Code : 66243

Day and Date : Wednesday, 17-05-2017

Total Marks: 180

Tune : 10.00 a.m. to 1.00 p.m.

- Instructions: 1) All Questions are compalsory.
 - Figures to the right indicate full marks.
 - Assume suitable Data wherever necessary and state is clearly.
 - Use of azientific non-programmable calculator is permitted.

Q1) Solve any three.

- Explain the different modes of heat transfer with suitable example and also give basic law for each one.
- b) Define overall heat transfer coefficient, and also derive an expression for overall heat transfer coefficient 'U', for a composite wall having two plotes in series with thermal conductivities 'K_n' and 'K_n', having hotfluid at temperature "T₁' with heat transfer coefficient 'h_n' on oue side and cold fluid temperature "T_n' with heat transfer coefficient 'h_n' on other side.
- (c) The wall of an over is 40 cm thick having its thermal conductivity of 0.7 Wink. The interior surface of the over is maintained at a temperature of 800°C and the outside wall temperature is 200°C. The total surface area of wall of the over is 2m². Find the thermal realistatice, heat flow one and the heat flux. [6]
- A plane wali is 15 cm thick of surface area 4.5m². Theread conductivity of the wall is 9.5Wink. The inner and outer surface of the wall isomintation at 150°C and 45°C respectively. Determine, [6]
 - Heat flow rate across the wall.
 - Temperature gradient in direction of heat flow.

Q2) Solve the following:

 Derive the general heat conduction equation in Carsesian co-ordinate system. Also write the special cases of this equation.
 [8]

OR:

- b) Derive the equation for temperature distribution and heat transfer for a solid sphere under steady state condition with uniform beat generation and convert it in terms of outside heat transfer coefficient and outside temperature of the thrid 'Tam'. [8]
- c) The steady state temperature distribution in a plane wall is given as,

 $T = 600-2500 \text{ x} - 12000 \text{ x}^2$, where "T' is in "C' and "x" is in instermeasured from the surface of outer wall. One dimensional steady state best conduction occurs in the wall. Assuming the thermal conductivity (k_{max} = 2.35 W/mk) and thickness bas 0.3 m. Determine. [8]

- 0 The surface temp. & overage temp. of the wall.
- The maximum temperature in the wall & su-location.
- iii) The item fluxes of the surfaces.

Q3) Solve any two.

- a) Write short notes on,
 - Types and classification of fins.
 - Fin efficiency and fin effectiveness.
- b) What do you mean by initial and boundary conditions? What are the types of boundary conditions? [8]
- c) Fins are provided to increase the rate of best transfer from a hot surface. Which of the following will 1 have maximum heat transfer rate;
 [8]
 -) 6 fins of 10 cm length.
 - i) 10 fins of 6 cm length,

(Take 'k' for fin = 300 W/mk, b = 30 W/m/k, cross section area of fin = 2 em³, perimeter = 4 cm. Temperature of het surface = 230° C, Temperature of sorrounding air = 30° C)

[8].

(04) Seive any two of the following.

- Explain the phenomenon of Natural Convection and forced convection, What istment film temperature and Bulk mean temperature? [8].
- Water at the rate of 0.8 kg/s at 90°C flows through a steel table having 25 mm ID and 30 mm OD. The outside surface temperature of the pipe is 84°C and temperature of surronding air is 20°C. The room pressure is 1 atm and pipe is 15 m long. How much heat is lost by free convection in roum. Use correlation Na = 0.53 (Gr.Pr)⁶¹⁹. Take properties of air as p = 1.0877 kg/m², p = 1.9806 × 10⁻¹ kg/m/s, Pr = 0.702, k, = 0.02813 W/mK.
- c) Air at 20°C and 1.013 bar flows over a flat poste 40 m/s. The plate is 1 m long and is maintained at 60°C. Assuming unit depth, calculate the heat transfer from the plate. Use the correlation:Nu₁ = (Pr)⁻¹⁰[0.037(Re_))*850] Properties of air at 40°C are, ρ = 1.128 kg/m², C₂ = 1.005 kJ/kg°C, k = 0.0275 W/m²C, γ = 16.95×10°m²/s, Pr = 0.599. [8]

Q5) Solve say two of the feilewing,

so. State and Explain:

i) Kuchoff's Law

ii) Wien's Displacement Law

ii) Lambert's Cosine Law

by Planck's Lyne

- h) State Planck's law and Stefan Holtzmann law and hence derive Stefan Boltzmann law from Planks law.
 [8]
- Calculate the following for an industrial furnace in the form of black body and emitting radiations at 2500°C.

Monochromatic emissive power at wavelength 1.2 µ m.

ii) Wave length at which emission is maximum

iii) Maximum emissive power

tv] Totalemissive power-

-3-

[8]

- ()6) () Write short dotes on (any two);
 - i) Types of touling and its couses
 - i) Pool Beiling Curve
 - ii) Explain classification of heat exchanger with neat sketch.
 - b) Water at 225 kg/h is to be heated from 35°C to 95°C by means of concentric tabe heat exchanger Oil at 228 kg/h and 210°C with specific heat of 2095 J/kg/K is to be used as hot fluid. If the overall heat transfer coefficient based on outser diameter of the inner tabe is 550 W/m/K. Determine the length of heat exchanger, if the outer diameter is 100 mm. [6]

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Seat

T.E. (Mechanical) (Part-III) (Semester-V) (Revised) Examination, May - 2017 MACHINE DESIGN-I Sub. Code : 66244

Day and Date : Thursday, 18-05-2017 Time : 10.60 a.m. to 1.00 p.m. Total Marks : 100

basirections:

- All questionner compalsory.
- Figures to the right indicate full marks.
- 3) Make mitable assumptions wherever required and state them clearly.
- 4) Use of non-peopranerable calculator is permitted,
- 5) Drive next diagrams wherever accessary,

Q1) Solve any three.

[18]

- Describe various steps involved in design of a machine element.
- b) Suggest with visufication the suitable material for the fellowing:
 - i) Side Stand Spring of Bike
 - i) Lathe Tail-Stock
 - 10 Water Bottle

c) Draw near above of a knuckle joint and explain the design procedure.

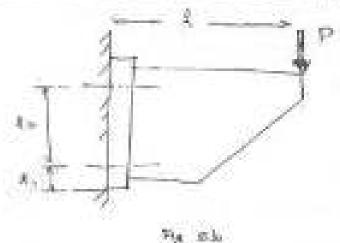
d) Explain design of butt weld joint under tention.

QZI a) A tum-backle used for a stay rope of an electric post is subjected to a force of 15 kN. The pennisible tensile stress for the starl rods used in 72 MPa. The pennissible tensile and shear stress for the cast iron coupler not used is 32 MPa. Design and sketch the tum-backle. [8]

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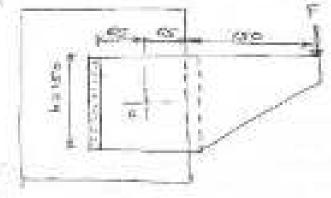
b) A cast icon bracket is fixed to the steel structure as shown in figure 2h 1t supports a lood P of 30cN. There are two bolts at A and two bolts at B. The distance are as follows: l₁ = 50mm, l₂ = 300mm and l = 600mm. Determine the size of the bolts, if maximum permissible tenaile stress in the bolt is 50N mm². [8]

Designation	Pitch (mm)	Major or Nominal (Lamater(mm))	Minor or Core discuter(nm)
X00	3.59	30	25:706
5436	4,00	36	31,093
M42	4.30	-42	36.479
1698	5,90	48	41.866



OR

 A plate bracket welded to a stud column, and loaded eccentrically is shown in figure 2c. Assuming that the weld if the size of weld is 6x6mm, determine the maximum sizes influeed in 2c weld. Given: b = 150mm, F = 15kN.



- 03(1)
- Demonstrate the use of ASME code for shaft design with purphile example. [6] Design a shaft to trainenit power from an electric motor to a halte head b3-1 stock through a pulley by means of a horizontal belt drive. The pulles weighs 200% and is located at 100 mm from the conter of nearest bearing. Dispeter of the pulley is 200mm. Maximum power monarcitted is 1.2kW at 120rpm. Angle of lap of belt is 180° and the coefficient of friction between the belt and pulley is 0.3. Assume shock factors in bending and tornion as 1.5 and 2.0 respectively. Allowable shear stress in the shaft is 35 Nimeri. The pulley is mounted overhung on the shall. 101

OR.

- Design a rigid type of flange empling to connect two shafts. The imput 101 shaft insusatite 37.5 kW power at 180 norm, to the output shaft Grouph the anophing. The design torque is 1.5 times the nited torque. The moterial for shaft is 40CR (5 - 380N/mm², factor of safety = 2.5), instantal for key = 30CH(S_ = 400Nimm*, factor of safety = 2.5), material for flange FG 200 (S = 2000Virant', factor of safety = 6.00 based on ultimate stienath). 6301.
- Explain with next sketches at les of ends of Publical compression aprings -041.41 indicating active number of turns in each case. 161
 - Safety valve of 60 nm diameter is to blow off at a pressure of 165 1.2 Nonm³. It is held on its seat by closed only helical spring. The mealmen lift of valve is 10 mm. Design a suitable compression spring of spring index 5 and providing an initial compression of 35 mm. The maximum shear stress in the material of while is limited to 500 N/mm2 The modulus of highlity for spring moterial is 60 kN/mm². Assume squared and ground ends. Calenhore: 1101
 - Diameter of spring wire а.
 - Most coil dismeter EU.
 - (ii) Number of active turns and
 - by Pitch of the ceil

Assume Whit's Stress factor $K = \frac{4C-1}{4C-4} + \frac{0.615}{C}$

Standard wire gauge (SW07) number and corresponding diamater of string wire is given in the following table.

8.966	40	50	4.9	240
Diameter		1.5.5.5		
(mm)	10.163	10.973	11.785	12.70

13.23

Q5) (c)

Derive an expression for torque coquired to suise the loss uning square threaded acrew. 162

OR

- What do you understand by overlututing and self locking of power acress? iΩ. Hence deduce the condition for self locking screw.
- 663 The nominal diameter of triple threaded screw thread is 20 mm, while the 187 pitch is 8 ner. It is used with a culter having outer diameter of 100 mm and inner diameter as 65 mm. The coefficient of fliction at thread surface as well as collar surface may be taken as 0.15. The screw is used to raise Jead of 15 XN. Using uniform were theory for collior disction, calculate.
 - Torque required to raise the lead, 15
 - $\{10\}$ 35 Torque required to lower the load,
 - The force required to cause the load of applied at a radius of \$500 mm 18) I
- Explain the step by step procedure for selection of Flat beit from 06140Manufactures 's Catalogue.
 - 163 It is require to design a V-belt drive to connect a 20 kW, 1440 rpm 10Motor to a compressor carming at 480 upth for 15 hours per day. The space is available for a center distance of approximately 1.2 m Refer

Beamine:

Diameters of motor and composisor pulley ā.

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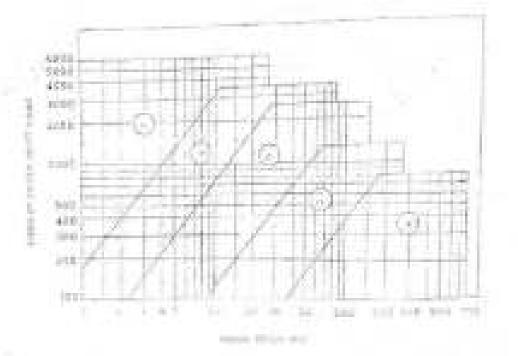
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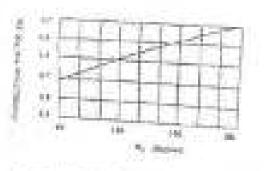
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SL-317 Total No. of Pages 13

Seat No.

T.E. (Mechanical) (Semester - V) (Revised) Examination, May - 2017 MANUFACTURINGENGINEERING Sub. Code : 66245

Day and Date : Friday, 19 - 05 - 2017 Time : 5:09 a.m. to 1:00 p.m.

Total Marks : 100

Instructions : 1) All questions are compulsary.

- 2) Figures is the eight indicate full marks.
- 3) Assume if necessary sainable data and state them cleasty.
- Use of non-programmable calculators is permissible.

SECTION - 1

Q1) Solve any two:

- Draw uset elastch of Single point cutting tool and explain different angles provided on single point cutting tool. [8].
- [b] Explain Onhogonal & Oblique Cutting Operation with near sketch. [8].
 - Diffing orthogonal turning operation of, following observations were made. Cutting force(Fit)=15kg, Ferci force(Fv)=fikg, Bake angle(a)=16², Foed(t₁)=0.2mm, Chip thikness(t₂)=0.4mm. Cutting Speed(V)=60m/min. Find out, [8]
 - b) Shear angle.
 - ii) Workdone in shear and
 - iii) Sheer strain.

Q2) Solve the following questions:

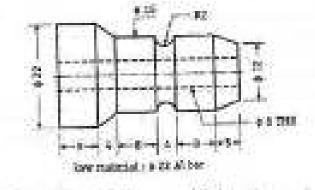
Explain concept of Heet generation in metal cutting & use of coolams. [8]

 OR_{c}

- a) Explain with sizetch various types of drill.
 [8]
- b) The tool life of a Single point cutting tool is 10 minutes when it is openated at 240m /min. At what speed it should be operated in order to have a tool life of 180 minutes. Assume n=0.3 [8]

Q3) The component shown in fig. is to be processed on a single spindle automat. Study the component and prepare: [18]

- a) Detailed process sheet.
- b) Tool Layout.
- c) Camprofile for drilling operation.
- d) Calculate Production rate per hour.



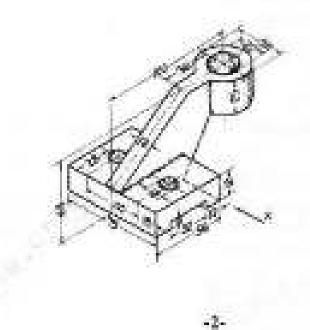
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SECTION - II

Q4) Design & draw most dimensional drawing in three views with one sectional view of jig for drilling two holes 612 as shown in figure. [26]

OR

Design & draw next dimensional drawing in three views with one sectional view of Milling fixture for face milling of 636 to maintain the height of 25mm. Also Justify the selection of location, clamping & guiding elements.



Q5) Solve any two.

- Explain with sketch nomenclature of Press Tool.
- b) Write design considerations for die element.
- 2) Explain different types of strippers.

Q6) Write short notes on any three.

- a) Construction & working of CNC.
- [5] Automatic Tool Changes.
- c) Modular Tooling System.
- d) Comparison between NC and CNC machines.

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T.E. (Mechanical Engineering) (Part-III) (Semester -(Revised) Examination, April - 2018 THEORY OF MACHINES - 11

Sub. Code : 66242

Duy and Date : Wednesday, 25+4-2018 Time : 10.00 a.m. to 1.00 p.m.

Total Marks ; 100

Instructions :	1)	All questions are compulsions,
	1.784	A REAL PROPERTY OF A REA

- Figures to the right indicate full marks, ЪЪ.,
- Draw next labeled sketch wherever necessary, 43.1
- Assume if necessary suitable data and state clearly. S_{2}
- Use of Nan programmable calculator is permitted.
- Derive an excression for the centre distance for a pair of spiral gears and on a define the following terms. 183
 - Ð. Normal nitch
 - 韵. Axial pitch

OR I

Prove that the condition for maximum efficiency in case of spiral gear la

 $\alpha = \frac{\theta + \phi}{\pi}$ where, $\phi =$ friction angle, $\delta =$ shaft angle and $\alpha =$ spinsl angle

on the driving wheel.

- Two involute gears of 20° pressure angle are in mesh. The number of b) . teeth on pinion is 20 and the gest ratios is 2. If the pitch expressed in cooclule is 5 mm and the pitch line speed is 1.2 m/s, assuming addendum as standard and equal to one module, find the maximum velocity of slidinat 1103
- Explain the working of Differential gear of an automobile. (02) ab

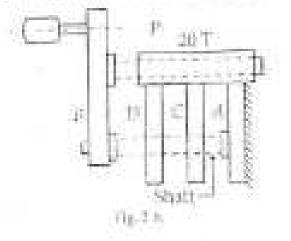
CRC

Explain the concept of squivalent mass and moment of instills applied for ever trains,

 B, T, Q_i

161

b) Fig. 2 b shows an opicyclic gear train. Gear 'A' is fixed to the financ and is therefore stationary. The ann 'B' and gear 'C' and 'D' are fixe to rotate on the shaft. Gears 'A', 'C' and 'D' have 100, 101 and 99 ideth respectively. Pitch circle discustors of all are the same so that the planet gear 'P' meshes with all of them. Determine the revolutions of gears 'C' and 'D' for a revolution of the arm 'B'. [10]



- Q3) a) Durive the expression for gynoscopic couple magnitude. [6]
 b) A two wheeler of 400 mm wheel radius is negativing a turn of radius 60 m at speed of 100 km/h. The combined mass of vehicle with its rider is 300 kg. The C.G. of rider is 0.6 m above ground level. The main moment of inertia of engine flywheel is 0.3 kg-m³ and moment of inertia of engine the speed of the engine is five time the speed of the engine is five time the speed of the speed of the engine is five time the speed of the engine is five time the speed of the speed of the engine is five time the speed of the speed of the engine is five time the speed of the speed speed
- (Q4) a) Derive an expression for velocity and acceleration of the slider of slider crank mechanism. [6].

OR.

Explain dynamically equivalent system to replace connecting rod by a two mass system.

the wheel and in the same direction, find the angle of heel of vehicle, [10].

b) The connecting red of a vartical reciprocuting engine is 2 m long between unities and weights 250 kg. The mass centre is 800 mm from the big end bearing. When suspended as a produlum from the gudgeon pin axis, it makes 8 enaplete oscillations in 22 seconds. Calculate the radius of the gyration of the red about an axis through its mass centre. The crank is 400 mm long and rotates at 200 rpm. Find the inertia torque elected on the centleshaft when the crank has turned through 40° from the top dead centre and the piston is moving downwards. [10]

Q5) d) Explain direct and revense crank method for balancing of the radial engine.[6]

OR

Explain what is multi-cylinder inline engine: Also explain conditions to have primary and secondary forces and couple balancing in multi-cylinder in line engine.

b) Four masses A, B, C and D as shown below are to be balanced. [12].

	Ă	В	G	D
Mass (kg)	-	3.6	50	- 40
Radius (mm)	150	240	120	150

The planes containing masses B and C are 300 mm aport. The engle between planes containing B and C is 90°. B and C makes angles of 210° and 120° respectively with D in the same sense.

Finer.

- B The magnitude and the angular position of mass A, and
- i) The positions of planes A and D.
- (06) a) Explain maximum fluctuation of energy and coefficient of fluctuation of surge.
 - b) The turning moment diagram for a multi-cylinder engine has been drawn to a scale 1 mm = 600 N on vertically and 1 mm = 3° horizontally. The intercepted areas between the output tonque curve and the mean resistance line, taken in order from one end, are as follows:

+52, -124, +92, -140, +85, -72 and +107 mm², when the angine is running at a speed of 600 rpm. If the total fluctuation of speed ±15% of the mean, find the necessary mass of the flywheat of radius 0.5 m. [10].

SV-84 Total No. of Press : 3

T.E. (Mechanical) (Part-III) (Semester - V) (Revised) Examination, April - 2018 HEAT AND MASS TRANSFER Sub. Code : 66243

Day and Dute : Thursday, 26 - 04 - 2018 Time : 10.06 a.m. to 1.00 p.m.

Total Marks: 100

Instructions: I)

Seat. No.

-) All quartiens are compulsory.
- 2) Figures to the right indicate full marks.
- Assume Suitable Data wherever necessary and state it Clearly.
- Use of scientific non-programmable calculator is permitted.

Q1) Solve any three:

- Define critical radius of insulation. Also derive the equation for critical radius of insulation for hollow cylinder. [6]
- b) What are the modes of mass transfer? Explain Fick's law of diffusion [6]
- c) Air at 90°C flows in a copper tube (k = 384 W/mK) of 4 and lineer diameter and with 0.6 cm thick walls which are heated from the outside by water at 125°C. A scale of 0.3 cm thick is deposited on outer surface of the tube whose thermal conductivity is 1.75 W/mK. The air and water side heat transfer coefficients are 221 and 3605 W/m²K, respectively. Find overall heat transfer coefficient on the outside area basis. [6]
- d) A steam pipe is covered with two layers of insulation. The inner layer (k=0.17 W/mK) is 30 mm thick and the outer layer (k = 0.093 W/mK) is 50 mm thick. The pipe is made of steel (k = 58 W/mK) and has inner diameter and outer diameter of 160 and 170 mm, respectively. The temperature of saturated steam is 300°C and The ambient air is at 50°C. If the inside and outside heat transfer coefficients are 30 and 5.8 W/m/K, respectively, calculate the rate of heat loss per unit length of pipe. [6]

Q2) Solve any two:

a) Steel ball bearings (a = 50 W/mK, a = 1.3×10° m³/s) having a diameter of 40 mm are heated to a temperature of 650°C and then guarached in a tank of oil at 55°C. If the heat transfer coefficient between ball bearings and oil is 300 W/m²K. Determine the duration of time the bearing must remain in an oil to reach a temperature of 200°C. [8]

ETO.

- b) A plate 2 cm thick and 2 cm with is used to heat a fluid at 30°C. The heat generation rate inside the plate is 7×10° W/m³. Determine heat transfer coefficient to maintain the temperature of the plate below 180°C. Take k for plate 26 W/mK. Neglect heat losses from the edge of plate. [8]
- c) Derive the equation for temperature distribution & heat transfer through a plane wall with uniform heat generation; also convert this equation in terms of ambient temperature & the heat transfer coefficient. [8]

Q3) Solve any tino:

- Explain the error estimation of temperature measurement in themao-well.[8]
- b) Derive the expression for temperature distribution for a short fin with convective tip.
 [8]
- c) An aluesinom alloy fin (k = 200 W/mK), 3.5 mm thick and 2.5 cm long protrudes from the wall. The base is at 420°C and ambient air temperature is 30°C. The heat transfer coefficient may be taken as 11 W/m/K. Find the heat loss and fin efficiency, if the heat loss from the fin tip is negligible.

Q4) Solve any two of the following:

n) Give the physical significance of

- i) Nusselt Number
- i) Grashoff's Number
- ii) Reynolds Namlser
- iv) Prandti Namber
- b) Assuming a man as a cylinder of 40 cm dismeter and 1.72 m height with surface temperature of 37°C. Calculate the heat loss from his body while standing in wind flowing at 20 km/hr at 17°C. Use following correlation:[8] Nu = 0.027 Re^{1.40} Pc¹⁰

The properties of fluid at mean film temperature are g = 1.1614 kg/m², $\theta = 184.6 \times 10^{-7}$ Ns/m², Pr = 0.707, k = 0.0263 W/mK.

c) Estimate the heat transfer rate from 100 watt incandescent hole at 140°C to an ambient sir at 24°C. Approximate the bulb as 60 cm diameter sphere and calculate percentage loss by natural convection. Use following correlation; (a) [8]

Nu = 0.60 [Ge.Pr]

The properties of air as 82° C are kinematic viscosity(7) - 21.46 10 °m²/s, K = $30.38 \times 10^{\circ}$ W/mK, Pr = 0.699.

[8]

18L

- Q5) Solve any two of the following:
 - a) Write shart Note on:
 - i) Radiation shape factor
 - ii) State and prove Kirchhoff's Law
 - b) Write Plank's law and derive Stefan Boltzmann law from Plank's law.[8]
 - c) Calculate the following for an industrial furnace in the form of black body and emitting radiations at 2500°C. [8]
 - Monochromatic emissive power at wavelength 1.2 ten.
 - Wavelength at which emission is maximum.
 - Masimum emissive power.
 - iv) Total emissive power
- Q6) a) Write short notes on:

201-7-205

[12]

and the second

- 0 Define Fouling factor and explain causes of fouling.
- i) Types of Condensation and boiling
- b) Hot oil with capacity rate (m×C_) of 2500 W/K flows through a double pipe heat exchanger. It enters at 360°C and leaves at 300°C. Cold fluid enters at 30°C and leaves at 200°C. If overall heat transfer coefficient (U) is 800 W/m²K, determine the heat exchanger area required for parallel and counter flow. [6]

670

SV ~ 85 Total No. of Pages : 4

Scat. No. 1

T.E. (Mechanical) (Part -III) (Semester - V) (Revised) Examination, April - 2018 MACHINE DESIGN-I Sub. Code: 66244

Day and Date : Friday, 27 - 64 - 2018 Time :10.09 a.m. to 1.86 p.m. Total Marks (100

1181

Instructions: 1) All questions are compulsary.

- 2) Figures to the right indicate full marks.
- Make outable assumptions wherever required and state then clearly.
- 4) Use of nen-programmable calculator is permitted.
- 5) Draw near diagrams wherever necessary.

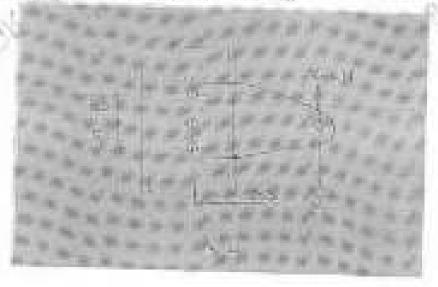
Q1) Solve any Three:

- Discuss the guidelines for the selection of quantitative values of 'factor of safety".
- b) Suggest with justification the suitable material for the following:
 - Large Flywheel
 - ii) Helical spring
 - ii) Dairy Equipment
- c) Discuss the design of a bell-crank lever.
 - d) Discuss different types of stresses in bolt design.
- (Q2) a) A knockle joint used to connect two mild steel rods has to transmit a tensile load of 200 kN. Given: yield point strength of the material in tension 200 N/mm² and factor of safety = 2. Allowable stress in compression is two times the allowable stress in tension, and allowable stress in shear as 0.707 times that in tension. Design the knuckle joint [8]

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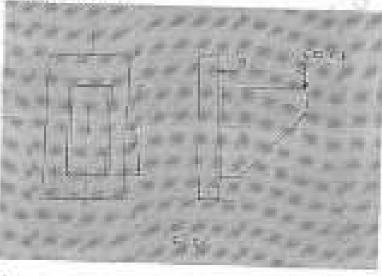
SV - 85

b) A steel plate is subjected to a force of 6 kN and flood to the channel by means of three identical bolts as shown in figure 2b. The bolts are mode of plain carbon steel 30C8(S_p -400N/mm², factor of safety = 3). Determine the nominal clameter of bolts. [8]



OR:

c) Figure 2c shows a bracket is welded to the vertical plate by means of two filler welds. Determine the size of welds if the permissible shear stress is limited to 72 N/mm³.



- Q3) a) What are various types of keys? Compare stresses in woodruff key with flat key?
 - b) The propeller shaft is required to transmit 45 kW power at 500 rpm. It is a hollow shaft made of plain carbon steel and the permissible shear stress is 84 N/mm². Calculate the inside and outside chameters of the shaft for [10].

Ratio of an inside diameter 0.6 times the outside diameter.

ii) Ratio of an inside diameter 0.65 times the outside diameter.

Determine the % saving in material by modifying the ratio.

OR.

Design a bushed-pin type flexible coupling for connecting a motor shaft.
 To a compressor, with the following service conditions:

Power to be transmitted = 50kW

Speed of motor shaft = 1000np.m

Diameter of exctor and compressor shaft = 55mm

Bearing pressure on the rubber hush = 0.7 N/mm²

Allowable stress in the pins = 60 Mpa.

Allowable shear stress in the keys and shafts = 45 Mpn

Allowable crushing stress in the keys = 60 MPa.

Allowable shear stress in the flange material - 15 Mpa

- Q4) a) Explain with neat sketches, the stresses induced in helical spring of circular cross section. [6]
 - (b) Design helical compression spring for a maximum load of 1000 N for deflection of 25 mm using the valve having spring index of 5. The inavituum permissible shear stress for spring wire is 420 MPa and modulus of rigidity is 84 kN/mm². Assume squared and ground ends. [10]

Assume What's Stress factor $X = \frac{4C-1}{4C-4} + \frac{0.615}{C}$

Where C - spring index.

SWG	1	2	3	4	5
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Q5) a) Discuss Various forms of threads used for power transmission giving their relative merits and limitations. [6]

OR

a) Derive an expression for maximum efficiency for square threaded screw.

SV - 85

- b) The cutter of machine is pulled by square threaded screw of 55 mm external diameter and pitch of 10 mm. The operating aut takes the axial load of 400 N on a flat surface of 60 mm and 90 mm internal and external diameter respectively. If the coefficient of friction is 0.15 for all contact surfaces on nut. Determine power required to rotate operating nut when cutting speed is 6m/min. Also find efficiency of the screw: [12]
- Q6) a) Explain the step by step procedure for selection of V belt from Manufacturer's Catalogue. [6]
 - b) It is required to select flat belt drive to connect two transmission shafts rotating at 800 rpm and 400 rpm respectively. The centre to centre distance between the shafts is approximately 3m and the belt drive is open type. The power transmitted by the belt is 30 kW. The lead correction factor is 1.3. The belt should operate at velocity between 17.80 m/s to 22.90 m/s. The power transmitting capacity of the belt per mm width per ply at 180° are of contact and at a belt velocity of 5.08 m/s is 0.0147 kW. Select preferred pulley diameters and specify the belt. Refer the tables given below:

	2.5		- Marca I	s cour	act 1.41	enon dis ¹ 2			100	
α_i (Digg)	130	140	150	160	170	130	199	200	1	
F_2Q	1.26	1.19	1.13	1.08	1.04	1.00	0.97	0.04		
		Stan	idard 3	vidths (if thes	e belts i	n mm		-	
3-Ply	25	40	50	63	76					
4 - Phy	40	44	50	63	76	90	100	112	125	152
5-Ply	76	100	112	125	152		0.581		V082	
6 - Piy	112	125	152	180	200					
For flat p follows	olley	s: Seri	es of p	referrer	i value	s of pitt	:h dian	ieters (in ma) are
Pitch dire	beler,	(mm):	125	132	140	150	160	170	180	190
200 212	224	236	250	265	280	300	315	355	375	400
425 450	475	500	\$30	560	600	630	670	710	750	800
900 1006		96							A	82
	630								20	

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Total No.	of Pages : 3

T.F. (M) (Semester - V) Examination, April - 2019 CONTROL ENGINEERING

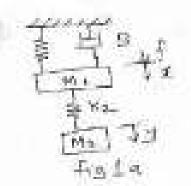
Sub, Code: 66241

Day and Date : Thursday, 25 - 64 - 2019 Time : 2.30 p.m. to 5.30 p.m.

Seat. No.

Total Marks : 140

- Instructions) D. All quastines are compalsory.
 - 2) Assume suitable data if required and mention it clearly.
- Q(1) a) For the mechanical system shown in Fig. 1a construct grounded chair representation and find equation relating f to x and a to y [6].

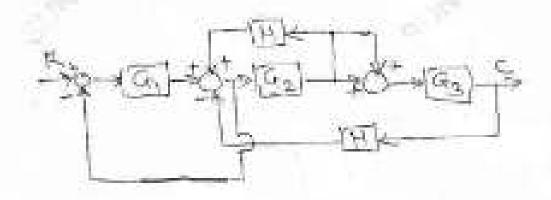


 b) Explain mothematical model of hydraulic system. [6]
 c) Construct direct and Inverse analog for Electrical circuit shown in fig. Find mechanical circuit with equations. [6]

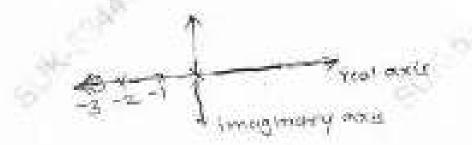


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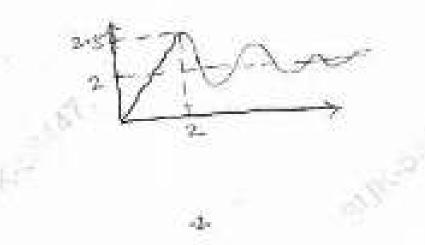
- Q2) a) What do you mean by linearization of non-linear function. Explain geometric, interpretation of error in the measurement of area of a rectargle having width W and length I. [8]
 - b) Find the transfer function for the block diagram shown in fig. [8].



Q3) a) Pole zero configuration of the overall transfer function is shown in fig. Determine its response for unit step input. [8]



b) The step response of a second order control, control system is shown in figure. Determine closed loop transfer function of the system. [8]



Q4) a) Using Roots stability criterion. Determine stability of system having its open loop transfer function has poles at s = 0, s = -1, s = -3 and zero at s = -5 take gain k = 10.
[8]

b) Sketch root locus for
$$G(s) \cdot \Pi(s) = \frac{k(s+2)}{(s+1+j\sqrt{3})(s+1-j\sqrt{3})}$$
 [10]

- Q5) a) Draw bode plot for transfer function G(x) = 1000 x(1+0.1x)(1+0.001x).
 Determine gain mirgle and phase margin. [10]
 b) Calculate break in point and angle of departure for control system given by characteristic equation x¹ = 2x+3+h(x+2)=0. [6]
- Q6) a) Determine state space representation and computer diagram using series

programming
$$r(t) = \frac{2(D+3)}{(D+2)(D+3)(D+4)} f(t)$$
. [8]

b) Determine state space representation and computer diagram using general programming $p(t) = \frac{D+3}{(2^2+9D^2+24D+20)} f(t)$. [8]

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SV-86Total No. of Pages ; 3:

T.E. (Mechanical) (Semester - V) (Revised)
Examination, April - 2018
IANUFACTURING ENGINEERING (Paper - II
Sub. Code: 66245

Day and Date : Saturday, 28 - 04 - 2018 Time : 9.30 a.m. to 1.30 p.m.

Total Marks : 100

 \mathbf{D}

- Instructions: All mestions are compulsary. 11
 - 25 Figures to the right indicate full energy.
 - Assume if precessary suitable data and state them elevely. 31
 - Use of non-programmable calculators is permissible. 81

SECTION - 1

OI) Solve any two :

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No.

- Draw next sketch of a Single point cutting tool and explain different 20angles provided on single point carring tool. [83]
- Explain Onlingonal & Obligae Cutting Operation with neat-sketch. [8] b).
- During orthogonal turning operation of, following observations were 161 made. Costing force (Fb) = 15 Kg, Feed force (Fv) = 6 Kg, Rake angle $(\alpha) = 10^{\circ}$, Peed $(t_i) = 0.2$ mm. Chip thikness $(t_i) = 0.4$ mm. Cutting Speed (V) = 60 m/min. Find out : [8].
 - Shear angle. Ð.
 - Workdone in shear and Ð.,
 - iiin I Shear strain.

O2) Solve the following questions :

Explain concept of Heat generation in metal cutting & use of coolants, 80.

181

181

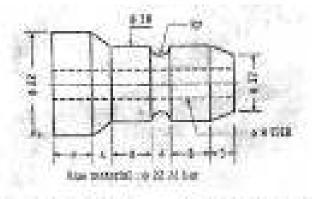
OR.

- Explain with sketch various types of drill. 23.
- The tool life of a Single point cutting tool is 10 minutes when it is operated 63. at 240 min. At what speed it should be operated in order to have a tool life of 180 minutes. Assume n = 0.3. 181

ETO.

Q3) The component shown in fig. is to be processed on a single spindle notcorest. Study the component and prepare : [18]

- 1) Detailed process sheet.
- b) Tool Layout.
- c) Cam profile for drilling operation 68 through
- d) Calculate Production rate per hour.



Material - Although 22

All directions are in intra-

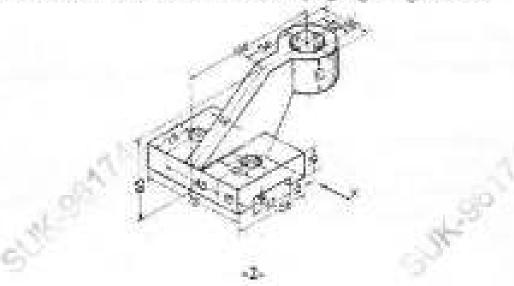
SECTION - II

Q4) Design & draw near dimensional drawing in three views with one sectional view of jig for drilling two holes \$12 as shown in figure. [26]

$OR_{\rm c}$

Desing & draw near dimensional drawing in three views with one sectional view of Milling fixture for face milling of \$66 to maintain the height of 25 mm.

Also Justify the selection of location, elonging & guiding elements.



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[6]

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Q5) Solve any two :

- Explain with sketch nomenclature of Press Tool.
- b) Write design considerations for die element.
- c) Explain different types of strippers.

Q6) Write short notes on any three :

- a) Construction & working of CNC.
- b) Automatic Tool Changer.
- c) Modular Tooling System.

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d) Comparison between NC and CNC machines.

SV-87 Total Net Pages 13

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T.E. (Mechanical Engineering) (Part - I) (Sensester - V) Examination, April - 2019 THEORY OF MACHINES-II Sub, Code: 66242

Day and Date : Samurday, 37 - 94 - 2019 Thur : 2.30 p.m. to 5.30 p.m.

Total Marks : 190

Independent: 13 Alla

-) All questions are compalyory.
- 2) Eigenen to the eight leskeats fall marks.
- 3) Moles south the sizes reptions whereas required and stars these clearly-
- 4) Use of tone programmable calculator to permitted.
- 5) Drave used diagrams whatever ascentury.

Q1) a) Derive the expression for numbers efficiency in case of spiral gear. [6]

OR:

Darive the equation for pester distance of a spiral gear pair.

- 10 A pinion having 30 teeth drives a grar having 80 teeth. The Profile of the grars is involute with 20 degree pressure angle, 12 in module and 10 mm addention. Find the length of path of optizer, are of contact, correct ratio and the maximum velocity of sliding if the pinion rotates at 105 t.p.m. [10]
- Q2) a) Compare the gear trains hased on speed ratio, Power insumitted, efficiency and application [6]

OR.

What do you mean by braking or the fixing tarque of a gear in epicyclic gear train? How can it be measured? [6]

PT.O.

b) In an epicyclic gear train shows in figure 2b, the wheel A is fixed wheel, wheels B and C are compound and mounted on me pia. If the sym F makes 600 rpm course; clockwise, find the second and direction of rotation of wheels D and E. Number of teeth on geom A.B.C.D and E ere 30,20,40.25 and 50 respectively. DEC



fig 20.

031.6

Derive an expression for angle of teel of a two wheeler taking a turn [6]

- b) A racing car of mose 2500 kg ites a wheel base of 2.5 m and a track of 1.5 m. The center of gravity of the vehicle is located at 0.5 m above ground and 1.5 m from front axis. The diameter of each wheel is 0.80m and mass massemi of inertia 0.77 kg-m2. The drive shaft, angute flywhool and transversioning are rotating in clockwise direction when viewed from from with equivalent more 150 kg with radius of genetics 15 cm. Determine load distribution on the wheals if the car is munding a curve at 100 m radius at 100 kea/he. Investigate for left tare rotatifant. Assume G=4,[10]
- Derive the equation for natural despacesy of compound pendulum. [6] O41 ab

OR:

Derive the equation for valuenty and acceleration of slider in reciprocating mzite mechanism. 16F

b) In a double setting vertical steam engine running at 560 spin, cylinder bure diameter is 25cm, stroke is 30 cm, diameter of piston rod is 3.75 on and length of concerting out is 69 cm. When the crunk has turned 170° from top dead center, the pressure of spant of cover and is 35+10° N/m² and at the grank and is 3+10⁴ N/m². If the mass of recip-testing parts is 45% infind piston effort and turning moment on the crask abov? for the given courk resident. FT WE

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SV-87

187

Q59 a) Explain direct and resume crask method used in balancing of milist inglines. [6]

OR .

Explain Industring of airig a revolving mass in different way.

- a) Asbuft carries four rotating nonsets A,B,C and D in this order along the shaft and are concentrated at radii of 12cm and 15cm, 14 cm and 18cm respectively. The masses at A,C and D are 15 kg, 10kg and 8kg respectively. The planes of rotation of A and B are 15 cm apart and of 9 and C are 18cm opart. The angle between the main of A and C is 90°, 17 the shaft is in complete dynamic balance, determine:
 - The angles between the radii of A, il and D.
 - (i) The distance between the planes of rotation of C and D.
 - it The mass m.B.

Sittington

1321

- Q(6) a) Explain Coefficient of fluctuation of speed and Coefficient of fluctuation of energy [6]
 - b) The requiring moment diagram for a multi-sydnder angete has been drawn to a scale trans- 600 N-m vertically and 1 and = 3° horizontally. The kilotoryted areas between the output to que ourve and the mean resistance line takes in order from one cud are as follows:

+52, -124, +92, -140, -85, -72 and +107mm³

Engine is running at 650 cpm. If the total fluctuation of speed is not at exceed = 1.5% of the mean, find the necessary mass of the fly-wheel of radius 0.5m. [10]

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SV-88 Tetal No. of Pages : 3

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and the second s	_	100

T.E. (Mech.) (Part - III) (Semester - V) Examination, May - 2019 HEAT AND MASS TRANSFER

Sub. Code: 66243

Day and Date : Friday, 03 - 05 - 2019 Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 108

instructions;

- 1] All questions are compubery.
- 2) Figures to the right indicates full marks.
- 3) Assume suitable data whenever measury and store it clearly.
- 4) Use of spacific onleakators is permitted.

Q1) Solve any three.

- Define optical radius of haulation. Also derive optation for critical radius of insulation for hollow sphere.
- b) Define overall heat transfer coefficient. Also derive the expression of systeal heat transfer for a wall having thickness b and conductivity K. Inside and outside heat transfer coefficient as b and b. [6].
- c) A strain pipe of Som ID and 6.5cm OD is insulated with 2.75cm thick insulation (K ~ 1.1W/mK) the inside and outside heat transfer coefficient are 4650W/m/K and 11.5 W/m/K respectively. The K of pipe material is 45W/mK if steam temperature is 200°C and ambient are is 20°C. Determine: [6]
 - Heat losa per meter length of pipe.
 - Interface temperature.
- d) A wall of cold storage contist of three layers, and outside layer of bricks 25cm thick, middle layer of cork, 10cm thick and an suser layer of content form, the K of materials are 0.7, 0.043 and 0.72. WinK respectively the temperature of outside surface of wall is 30°C and that of inner is ~15°C saleafste: [6]
 - Hertstarsfer perunit area.
 - i) Teniperature at interfaces at composite wall.

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SV-38

1161

Q2) Solve my too.

- Durive the general heat conductions equation in Cartesian Co-ordinate system. Also write the special cases of this equation. [8]
- Derive expression for temperature variation for a solid body with respect solding by using lumped heat capacity approach. [8]
- (i) A long rod of rachus 50cm having K = 10W/mK, which generates heat uniformly within the cylinder at the rate of 0.3X 10°W/m². The rod is cooled by convection form it's cylindrical surface at T₁ = 50°C with h=60W/m²K. Determine the temperature at the center and outside surface of cylindrical rod. 181

Q35 Solve any max-

- a) Write short notes on: [8]
 - Explain classification of fire with near sketch.
 - (i) Fin efficiency and fit effectiveness.
- Durive the expression for importance distribution in a fin of finite length with/invitated and.
- What are the initial and boundary conditions and their types? Explain with suitable courtyles.

Q4) Solve any two of the following.

- Explain in detail the phenomenon of natural and forced convection with wittable examples.
- Define Nusselt number and Reynolds number and prove that they are dimensionless numbers.
- c) A liquid metal flows at the rais of 4 kg/s through a constant heat flow 60 mm inner diameter tobe in a orielene reactor. The fluid in 200°C is 10 be iterated with the table wall 40°C above the fluid temperature. Determine the length of three table required for 25°C rise in bulk fluid temperature. Use the convolution, Nu=0.025 (RePY)*. Take ρ = 7.7 × 10° kg/m², u = 8 × 10° m²m²m, C_g = 130 J/kg °C, k = 12 W/m K and Pr = 0.011.

Q5) Solve any two of the following.

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SUNAR

- a) State Planks law and derive Stefan Boltzmenn law from Planks law,
- 10 Determine the shape factor F_{it} botween small area dA₁ and parallel chearlar disc 40. The small area is located at the axis of the disc A₂ at a distance L.
- () Explain the following terms:
 - i) Ittensity of radiation
 - Luniver cosine rule
 - 10 Absorptivity
 - iv) Reflectivity

Q6) Solve any flinar of the following.

Salt Stall

- a) Derive an expression for effectiveness of parallel flow haat exchanger. [6]
- b) Discuss the advantages of NTU method over LMTD method. [6]
- Design considerations for heat eachangers.
- d) Nusselt's theory of flimwise condetutation.

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SV=29Total No. of Parent #

Tend Marks : 200

T.E. (Mechanical) (Part - III) (Semester - V) (Revised) Examination, May - 2019 MACHINE DESIGN - I Sub. Code : 66244

Day and Bote : Monday, 96 - 18 - 2019

Time: 2.30 p.m. to 5.30 p.m.

North

Nati

Introctions: All questions are compuliery. 31

25 Figures to the right indicate full months.

- Make suitable assumptions wherever required and state them clearly. 31
- 91 Eye of mon - programmable estendador is permitted.
- 51 Draw near diagrams why there is consider.

Q1) Solve any These:

- a) List out steps involved in the design of a mochine element. Discuss what is 'working grawing.
- b) Suggest with justification the suitable conternal for the following
 - Diff.Bearing 6.3
 - Machine hed.
 - 17 Dairy Equipment
- Drawment sketch of a knockle joint and explain the design procedure. 1435
 - Discuss design of bait weld joint under tension. dS_{2}
- Design a turn-buckle to be used, for a stay man subjected to pull of 18 6023 altr kN. The permissible tensile spess for the steel rods used is 72 MPa. The permissible tensils and shear stress for the cast iron nut used is 36 MPa and 30 MPE respectively. Design the turn-buckle. Refer Table. (88)

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b) The following data is given for the bracket illustrated in fig. 2b. There is no prefetad in the bolts. The bolts are made of plain curbon storis 45Cl (8₁₁ = 380 N/mm²) and factor of safety is 2.5. Using the maximum factor stress theory, specify the size of the bolts. Refer Table. [8]

Desgunion	Pitch (inm)	Major or Nominal diameter(mm)	Core diameter(mm)	June ²)
M10	1.30	19	8.160	58.00
M12	1.78	12	9.858	84.30
Milé	2.00	16	13,546	157.00
M30 M22	2.30	23	16.933	245.00
M22	2.3	22	18,933	303
M24	.3.	24	20.340	353
M27	3	27	25,320	459
	-	n. 0	R	

2-25 xN e=102 mm L=150 mm L=25 mm

b) Figure 2n shows an eccentrically leaded welded joint. Determine the weld size. Allowable ilane storus in the weld is 80 MPa.

Q3) a) Discuss design of shaft for rigidity.

b) It is required to transmit a power of 7 kW at 750 rpm. The angular deflection of the steel of the steel spindle transmitting the power should not be more than 0.35° per meter length. The modelus of rigidity for the spindle material is 84 GPa. Determine the diameter of the spindle and the shear stress induced in it. [10]

OR:

b) It is required to design a rigid type of Cange coupling to connect two shafts. The input shaft transmits 40 kW power at 200 c.p.m. to the output shaft through the coupling. The design torque is 1.5 times the cated usque. Given: Allowable stress for key and shaft is 250 N/mm² is tension and compression, and 80 N/mm² is shear, Allowable stress for flarge material 38 N/mm².

SV - 89

- Q4) a) What are the various types of springs used in practice? Heplain one opplication of each. [6]
 - b) Design a helical spring for Ransbottom spring loaded safety splus for infloying working conditions, diameter of valve even is 05 mm, operating pressure in 0.7 N/mm², maximum pressure when the valve blows off freely is 0.75 N/mm², maximum lift of the valve when the pressure rises from 0.7 N/mm² to 0.75 N/mm² is 3.3 mm, maximum allowable stress is 550 N/mm², modulus of rigidity is 84 × 10⁴ N/mm² and the spring index is 6. [10]

Standard wire gauge (SWG) number and corresponding diameter of spring wire is given in the following table.

SWG	40	30	2/0	- 0	1
Disguster	10,160	5,490	3,839	B.229	7,620
10mm)		1		-	1

Q4) at

Derive an expression for maximum efficiency for square timesded acrew [6] OB

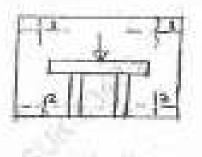
- What do you understand by overhauling and self looking of powor series? Hence deduce the condition for solf looking screw.
- b) Triple start square threaded screw is used to mise the load of 10 kN. A strew has a nominal diameter of 50 mm and a pitch of 8 mm, the beight of and is 40 mm and coefficient of friction between nut and screw is 0.12. There is no collor friction, find maximum shear stress induced in the screw and nut threads also find the boring pressure between acrew and rot. [32]
- Q65 a) Explain the step by step procedure for selection of V-ball from Manufacturer's Catalogue. [6]
 - b) It required to select a flat-belt drive for a fan training at 360 rpm, which is driven by 10 kW, 1440 rpm, motor. The belt drive is open - type and space is available for center distance of 7 m apps. Belt velocity should be between 17.8 to 22.9 g/s. The gower transmitting capacity of the belt per rum width per ply 180° are of contact and at a belt velocity of 5.08 m/s is 0.01188/W. The load contection factor can be taken as 1.2. Suggest preferred diameters for motor and fin pulloys and give complete specifications of beiting.

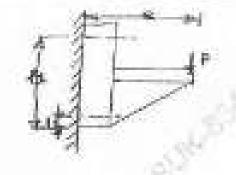
Refer the tables given below:

1169

SV - 89

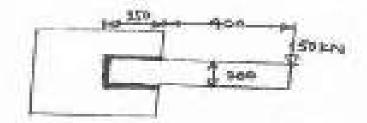
The serie				es for	pitch.	diame	iers in	THE REAL PROPERTY.		120
Pitch db 200 400 750	212 425 200	224 450 905	216 475 1000	102 250 500	140 265 530	150 280 560	160 300 000	170 315 632	355 1570	188 372 710
	2008		Are e	Con	tact Fr	1000 Č	P ₄ 5		200	-
o (Deg)	130	140	150	160	170	180	196	202		
F,	1.26	1,19	1.13	1,08	1.04	1.00	0.97	0.04		
2 IV		State	and W	klubs.	officer	e bett	s in m			
3-Ply	25	-40	.50	63	26	-	_		-	-
Hely	40	344 U.	50	45	25	00	116	118	100	152
549g	76	100	112	125	152	36	<u> </u>	114	100	1000
HW .	112	135	152	120	295					- 14





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 $-4\pi^2$

SV.90Total No. of Panas : 4

E.E. (?	dechanical) (Part - III) (Semester - V) (Revised)
	Examination, May - 2019
	MANUFACTURING ENGINEERING
02	Sub. Code : 66245

Day and Date : Wednesday, 08+05+2019 Time : 2.30 p.m. to 6.30 p.m.

Total Marks : 101

Instructions : 11.

Sout Nati

- All guestions are compulsary, Figures to the right indicate full marks.
- $\mathbf{2}\mathbf{i}$
- Assume suitable data wherever occupanty and state it clearly. 21.
- ю. Use of non-programmable calculator is allowed.

Q1) Solve any Two.

- Explain mechanics of chip formation with near sketch. 13.1 181
- b) Explain different types of tool material and list important properties of tool material. 186
- During machining of C-40 steel with 0-10-5-5-8-90-1 mm (ORS) shaped 21. carbide cutting tool, the following observations have been made:

Depth of eut	=1.5mm	
Feed	= 0.15 min/rev	
Speed	= 120 monin	
Tangeotial curting Sprag	= 1500 N	
Feed thrust force	= 900 N	
Chip thickness	- 0.3 mm	

Calculate:

Chip thickness ratio, shere angle, shere force and normal force at shear plane, friction force and normal force on tool face and coefficient of friction. [8].

PTO

Q2) Solve any Two,

- Discuss in brief types and selection criteria of custing fluid.
 [8]
- b) Draw tool geometry of drill and explain nomenclature in detail. [8]
- The following equation for tool life has been obtained for HSS tool;

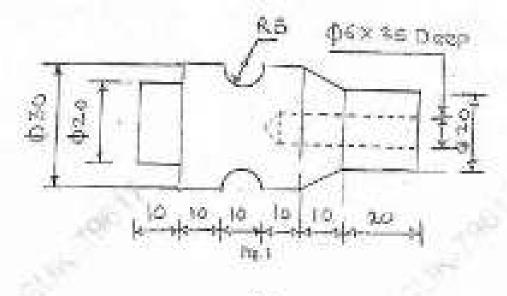
A 60 mm, tool life was obtained using the following cutting conditions:

V = 50 minute f = 0.3 mm; d = 2.5 mm

Calculate the effection tool life if spood, feed and depth of out and together increased by 20% and also if they are increased individually by 20%. [8]

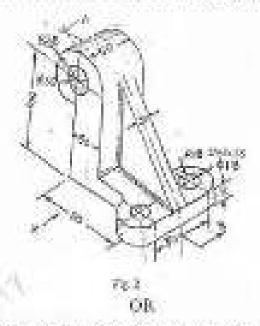
- Q3) The component shown in Fig. 1 is to be processed own single spindle amount. Study the component and prepare: [18].
 - a) Detailed process sheet
 - b) Tool layout
 - c) Cam profile for drilling operation

Material : M.S. polish bar \$30mm

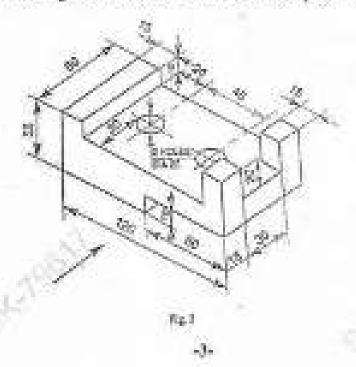


Q4) Solve my One

a) Design and draw a near dimensional drawing in three views with one sectional view of a suitable drilling jig for drilling two holes of \$18 mm as shown in Fig. 2. Show clearly the details of location, clamping and goiding of tool. Assume this as a final operation. [26]



b) Design and drawn dimensional drawing in three views with one sectional view of a milling fixture, for producing the 30 mm wide slot at the component shown in Fig. 3. Snow clearly the details of location, clamping and setting of catter. Assume this as a final operation. [26]



SV-90

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1228

Q5) Solve any two :

- a) Explain different methods of naturing outling forces in press working [6]
- b) Explain strip layout in press working,
- e) Estimate the blanking force to cut a blank 25mm wide and 30mm long from a 1.5mm thick metal strip, if the ultimate shear stress of material is 400N/mm². Also determine the work done if the percentage persentation is 25 percent of material thickness. (6)

Q6) Write short notes on any Three

- s) Automatic tool changer.
- b) Milling toollog system.
- c) Tool presetting.

Ball Road

Construction and working of DNC.

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SV = 937Total No. of Pages : 3

T.E. Mechanical (Semester - V) Examination, April - 2018 CONTROL ENGINEERING

Sub. Code : 66241

Duy and Date : Tuesday, 34 - 94 - 3918

Time : 10.60 a.m. to 01.00 p.m. Instructions :

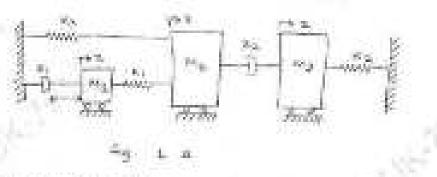
Total Marks : 100

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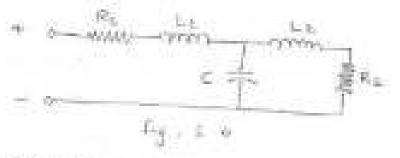
161

- All questions are compulsory. Б. 25
- Figures to the right indicate full marks.
- 041.22

For the mechanical system shown in figure is, construct grounded chair representation and find equation relating fide x.

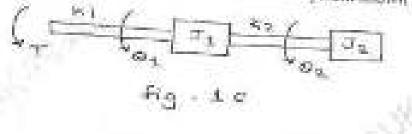


For the electrical circuit shown in figure 1b, construct mechanical system 113



61

Obtain mathematical model of rotational system abown in figure (c. [6]



Q20 nj. Determine linear approximation for the equation used to find area of right angle triangle. Use this approximation to calculate approximate area when height (E) and base (B) of right angle triangle is 10 units and 5 units respectively. Take filt - 12 and Bi = 4,

b)

- Reduce the block shown in figure 2b and obtain trausfer function. [8] 16 1653 S_{2} 6. 21. 26 69.26
- Q32 (i) A unity feedback system with an integral controller is shown in figure 3a. Determine response of system when v(t) = u(t) and $v(0) = C_1(0) = 0$ [8] 安静道 £.

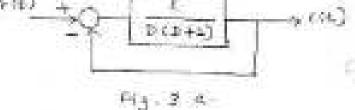
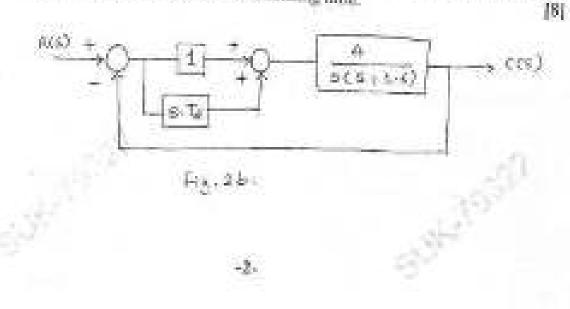


Figure 3 b aboves PO controller. Determine value of Td so that system is 35crineally damped. Calculate its settling time.



90 a) The characteristics equation of a feedback system is

 $\pi^{4} \pm 20 \kappa^{4} \pm 1.5 \kappa^{2} \pm 2\kappa \pm \kappa = 0$. Find value of κ if

0 System is marginally stable and

- System is in stable condition.
- b) Obtain coordinates for a unity the chark system with open loop transfer function $G(x) = \frac{k}{r(x^2 + 6c + 25)}$ [10]

SV - 937

[8]

10.01

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66)

Q52 v) Determine value of 2 and 6, so that unity feedback system oscillates at a frequency of 2 rad / sec. The system has open loop transfer function.

$$G(x) = \frac{A(x+1)}{x^2 + x x^2 + 2x + 1}$$

- b) Draw Bode plot $G(s) = \frac{100(s+0)}{(s+10)(s+100)}$
- (26) a) A system is represented by $\frac{r(t)}{r(t)} = \frac{D+4}{D^2+4D+3}$, construct computer diagram and state space representation using direct programming. [8]
 - b) Obtain state space representation and computer diagram using parallel programming for the system having transfer function [8]

 $\frac{d(j)}{d(j)} = \frac{D+1}{(D+1)(D+2)(D+3)}$

132.