Total No. of Pages 2 St.

Sent No.

S.E. (Mechanical) (Part - II) (Semester - IV) Examination, May - 2015 ANALYSIS OF MECHANICAL ELEMENTS

Sub. Code : 43592

Duy and Date : Tuesday, 05 - 05 - 2015

Total Maria : 100

[41]

3123

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

- Solve may three quantions from each solution. 43. Instructions: Asseming suitable data wherever necessary & state it clearly.
 - 2535
 - Figures to the eight indicates full unrelia.

SECTION -1

State the assumptions made in pure terrilon. OD = 0

Two Copper roals & one steel rod, each of diameter 20mm jointly support 1:1 a load of 100 kN as shown in figure 1.a. Calculate strusses in steel and copper rock. Also executive the load shared by each rod.

E.= 200 kNoran² & E. = 100 kN/mm².

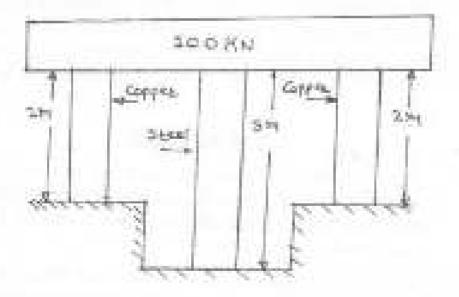


Fig. - 1.a

ETO:

\$-373

Q2) Draw the shear force and brading moment diagrams for the beam shown in figure-2. Locate a point of max, hending moment and point of controllexare in ray.

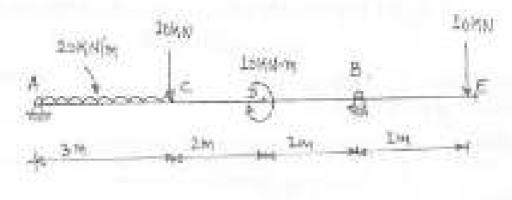


Fig.-2

- QUI iv) State the assumptions made in theory of simple hending. [4]
 - b) A cast iron bount of T-Section 8m long is simply supported in its ends. It entries a UDL of 1.5 EN/m over units longth. Determine the bending streamp and show it graphically. Plonge dimensions are 100mm × 20mm at Web dimensions are 120mm × 20mm. [3.3]
- Q49 'T' + shaped cross section of a brans with figure dimensions 200mm x 50mm and web dimensions 200mm x 50mm is subjected to a shear force of 400 kN. Calculate shear a masses across the section and show it graphically. MI of the section about the horizontal sectoral axis is 1,134 x 10° mm². [46]

SECTION - H

- Q5) ii) Rectangular har in mitigented to two direct masses in two mutually perpendicular directions. Derive an expression for unreal and tangantial stress on an oblique plane which is inclined at an angle 0 with plane of major stress.
 - b) At a point in a strained sumerial the principal stresses are 100 N/mm¹ tentile and 60 N/mm² compressive. Desprising normal, shear and resolution stress on a plane inclined at 50° to the axis of major principal stress. Also determine, the assistment stress at a point. [8]

8 - 373

- (26) 6) An elemental rube is subjected to a tensile stresses of 30 N/mm² and 10 N/mm² acting on two mutually perpendicular planes and a shear stress of 10 N/mm² on these planes. Draw Mohr's nircle and determine magnitude and direction of principal stresses and also maximum shear stress from Mohr's circle. [8]
 - b) Derive an appreasion for slope and deflection of a cantilever carrying UDL over entire span.
 [8]
- Q7) a) A captilever AB 2m long carrying load of 28kN at free and and 30 kN at 1m from free and. Find slope and deflection at the free and. Take E = 200 GPa and I = 150 x 10⁴ ram⁴.
 - Define equivalent length of solumn. Give the equivalent lengths for different esd conditions of column. [6]
 - c) Give the limitations of Fallers equation of backling local.
- Q8/ a) AT-sociation buying filange 150 x 20mm and web 100mm × 20mm is used as a struct of 4m long with hinged at both ends. Calculate Crippling load if young's modulus for material is 200 GPs.
 - b) Derive an expression for strain energy stored in a body when load is applied gradually.
 [8]



S-379

Total No. of Pages 1.3

Seat No.

S.E. (Mechanical) (Part - II) (Semester - IV) (Revised)

Examination, May - 2015

ANALYSIS OF MECHANICAL ELEMENTS

Sub. Code : 63361

Duy and Date : Thursday, 07 - 45 - 2015.

Total Marks : 199

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

Eastractions: 1) Actempt all questions.

- 2) Figures to the right indicate full marks to the question.
- 3) Draw must labeled shotch wherever necessary.
- (i) Assume suitable data, if accounty and state is clearly.
- 5) Her of non-programmable calculator is aflowed.
- Q17 a) Two vertical rod one of steel and other of copper are rigidly fixed at the top and 50cm apart. Diameters and length of each rod are 2cm and 4m respectively. A cross bar fixed to the rods at lower end, carrying a load of 5000N such that cross bar remains horizontal even after loading. Find stress in each bar and position of load on the bar. [12]

Take E for steel = 2 x 10⁴ N/mm³

E for copper = 1 x 104 N/mm1

 b) Define bulk modulus and derive relation between modulus of elasticity and bulk modulus.
 [6]

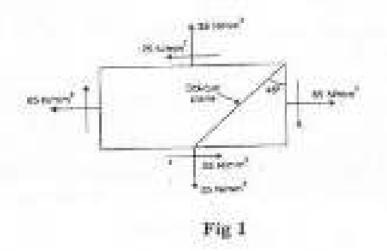
ØR.

b) A solid shaft of \$0mm diameter is to be replaced by hollow shaft of external diameter 100mm. Determine the internal diameter of the hollow shaft if same power is to be transmitted by both shafts at same angular velocity and shear stress.

P.T.O.

- 8 379
- (Q2) Draw shear force and bending moment diagram for a beam as shown in fig. Also locate maximum bending moment and point of contrafleature if any. [16]

- Q3) A cast iron beam is of I section having upper flange 80 x 20 mm, web 200 x 20 mm and lower flange 106 x 40mm. The beam is simply supported on a spin of 5m. If the tensile stress is not to exceed 20N7mm³. Find the safe UDL which beam can entry. Find also maximum compressive stress. [16]
- (24) a) Derive the expression for principal stresses and maximum shear stress for a member subjected to like direct stresses in mutually perpendicular directions. Also give the locations of principal planes and planes of maximum shear stress. [9]
 - b) A point in a strained material is subjected to stresses shown in Fig.1 Using Mohr's circle method, determine the normal and taugential stresses across the oblique plane. Check the answer analytically. [9]



-2-

h) An I-section beam 350 mm x (50 mm has a web thickness of 10 mm and a flange thickness of 20 mm. (Fig. 2) If the shear force acting on the section is 40 kN, find the maximum shear stress developed in the I-section. Also skitch the shear stress distribution across the section.

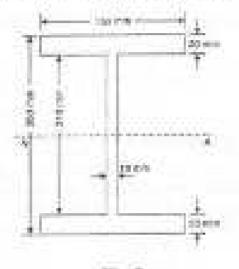


Fig 2.

- Q5) a) Derive the expression for slope and deflection of a simply supported beam subjected to an UEU. for the whole span, using double integration method.
 - b) A cantilever of length 2m carries a point load of 20 kN at the free end and another load of 20 kN at its centre. If E = 10^t N/mm² and I = 10ⁿmm⁴ for the cantilever then determine by moment area method, the slope and deflection of the cantilever at the free end. [8]

OIL

- b) State the importance of theories of failure and explain the maximum shear stress theory (Guest's Theory).
- (26) a) State the assumptions made in Euler's column theory and derive its expression for the orippling load when both the ends of the column are hinged.
 - b) A simply supported beam carries a point load P eccentrically on the spare. Find the deflection under the load using energy theorem. Assume uniform flexural rigidity.



S - 1309

Total No. of Pages : 4

Seat No.

S.E. (Mechanical Engineering) (Semester - IV) Examination, May - 2015 APPLIED NUMERICAL METHODS

Sub. Code : 63360

Day and Date : Tuesday, 05- 05 - 2015 Time : 19.00 a.m. to 1.00 p.m.

- 2) Make suitable assumptions/data if required and state clearly.
- 3) Draw sent skatches wherever necessary,
- Figures to the right indicate fell marks.
- 5) Use of coloutators is allowed.

QD a) Find the absolute error if the number X = 0.00545828 is

- Truncated to three decirual digits.
- Rounded off to three decimal digits.

b) Solve any two :

- Find the root of the equation using bisection method upto two decimal places xeⁿ - (cosx) = 0.
- Using Newton Raphaon method find the real root of e¹ x¹ + cos2πx which is near 4.5
- ii) Use the method of felse position, to find the fourth root of 32 correct to three decimal places.

Q2) a) Solve the following equations by Grans-Jordon method. [6] 2x - 3y + x = -1x + 4y + 5z = 25

3x - 4y + z = 2

b) Solve my two :

 $|2 \times 5 = 10|$

Solve the system of equations using LU Decomposition.

10x + y + 2z = 133x + 10y + z = 142x + 3y + 10z - 15

REG.

Fotal Marks : 199

 $12 \times 6 = 121$

141

ii) An opproximate solution of the equations

x + 4y + 7y = 5

2x + 5y + 8z = 7

3x + 6y + 9. 1x = 9.1 in given by x = 1.8, y = -1.2, z = 1 Improve this solution.

ii) Solve the following equations by Gauss-Seidal method.

3x + y + 6z + 98x + 3y - 2z = 13x + 5y + z = 7

Q3) a) Find f(x) as a polynomial in x for the following data by Newtons divided difference formula [6]

> x 1 -4 -1 0 2 5 f(x): 1245 33 5 9 1335

b) Solve any two (

 $|2 \times 6 = 12|$

 The result of measurement of electric resistance R of a copper bar at various temperatures the see listed below.

R : 19 25 30 36 40 45 50 R : 76 77 79 80 82 83 85

- ii) A controlled manufacturing process is 0.3% defective. What is the probability of taking 2 or more defectives from a lot of 100 pieces?
 - 1) By using Binomial distribution
 - 2) By poissions distribution
- Use Lagranges formula to find the form of f(x), Given

x : 0 2 3 6 f(x): 648 704 729 792

-2--

(24) Solve any three :

S = 1309 $13 \times 5 = 151$

- a) Evaluate the integral $l = \int_{1}^{1/2} ls \ r ds$ using Simpsons 1/3** Rule. Taken=6.
- b) Evaluate f^{*} (2x²+1)dx by Gaussian Quadrature.
- c) Use Rombergs method to evaluate $\int_{0}^{t} (ds/t) = s^{1}(t) \operatorname{take} h = 0.5, 0.25, and 0.125$
- d) A slider in a machine moves along a fixed straight rod. Its distance x enalong the rod is given below for various values of the time 't' seconds. Find the velocity of the slider and its acceleration when t = 0.3 second.

1.1	0	0.3	0.2	0.3	6,4	0.5	0.6
\mathbf{X} :	30,13	31.62	32.87	33.64	33.95	33,81	33:24

(05) Solve any three :

 $[3 \times 5 = 15]$

a) Find y(0.2) and y(0.1) by Modified Buler's Method,

if $\frac{dy}{dx} = x^2 + y^2$; y(0) = 1

b) Solve the boundary value problem for s = 0.5.

 $\frac{d^{2}y}{dx^{2}} + y + 1 = 0; y(0) = y(1) = 0.$ Take n = 4 using finite difference method.

- c) Solve $\frac{dy}{dx} = x + y_1$ given y(0) = 1. Obtain the values of y(0.1), y(0.2) using Picard's method.
- d) Find the largest Eigen value and the corresponding Eigen vectors by power method
 - $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

36

(W) Solve any three :

5 - 1309 $[3 \times 5 = 15]$

- a) Evaluate the integral $I = \int_{0}^{12} ln x dx$ using Simpsons 1/3rd Rule. Then ≈ 6 .
- b) Evaluate $\int_{0}^{0} (2x^{2}+1) dx$ by Gaussian Qaudrature.
 - c) Use Ramburgs method to evaluate $\int (dx A + x^2)$ take h = 0.5, 0.25, and 0.125
- d) A slider in a machine moves along a fixed straight rod. Its distance x cm along the rod is given below for various values of the time '4' seconds. Find the velocity of the slider and its acceleration when t = 0.3 second.

\mathbf{t}	0	0.1	0.2	6,3	0.4	0.5	0.0
\mathbf{X} :	30,13	31.462	32.87	33.64	33.95	33:81	33,24

(25) Solve any three :

 $[3 \times 5 = 15]$

a) Find y(0.2) and y(0.1) by Modified Hules's Method,

$$if \frac{dy}{dx} = x^2 + y^2 ; y(0) - 1.$$

b) Solve the boundary value problem for x = 0.5

 $\frac{d^2y}{dx^2} + y + 1 = 0, \ y(0) = y(1) = 0.$ Take n = 4 using finite difference method:

- c) Solve $\frac{dy}{dx} = x + y$; given y(0) = 1. Obtain the values of y(0.1), y(0.2) using Picard's method.
 - d) Find the largest Eigen value and the corresponding Eigen vectors by power method
 - $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

3-

Q6) (a) is compulsory

Solve any two pot of b), c) and d)

- a) Solve u_{yx} + u_{yy} = 0 in the square region bounded by x = 0, x = 4, y = 0, y = 4 and with boundary conditions:
 - u(0,y)=0

u(4, y) = 8 + 2y

 $u(x, 0) = 0.5x^{2}$

 $u(x,4) = x^2$

take $\Delta x = 1$, $\Delta yk = 1$. Perform two iterations. [10]

- b) Classify the following partial differential equations [5]
 - $i) \quad \ \ \mu_{xx} = 4 \mu_{xy} + (x^2 + 4y^2) \mu_{yy} \sin(x + y) \label{eq:eq:expansion}$
 - ii) $(x + 1)u_{xx} 2(x + 2)u_{xx} + (x + 3)u_{xx} = 0$

e) Write short note on Applications of Partial Differential Equation. [5]
 d) Compare Explicit and Implicit method. [5]



Total Ne. of Pages : 4

S.E. (Mech.) (Part - II) (Revised) Examination, May - 2015 FLUID AND TURBO MACHINERY

Sub. Code : 63362

Day and Date : Saturday, 09 - 05 - 2015

Total Marks: 199

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

Instructions: 1)

Scat. No.

- All questions are compulsory.
- Figures to right indicate full merks.
- Assume miltable date, if necessary and inificate clearly.
- Use of non-peoproximable calculator is allowed.
- QI) a) Define the hydraulic machines, turbines, pumps and also write classification of hydraulic turbines. [8]
 - b) A Pelton wheel produces 147 MW with a head of 1404m while running at 500 rpm. Assuming speed ratio as 0.46, overall efficiency 90%, jet ratio as 15, coefficient of velocity for nuzzle as 0.98 calculate [8].
 - i) Diameter of Jet.
 - i) Mean diameter of wheel,
 - ii) No. of jet.
 - iv) Discharge of the tarbine.

OR: :

c) A turbine running at 250 rpm gives 3700 kW under 12m basd. It is proposed to use the same design, altered to a suitable scale for a turbine giving 2200 Kw under 7.5m head.

Calculate:

The design speed.

ii) The scale ratio for the new machine:

(Q2) a) Show that the hydrautic efficiency for a Francis turbine having velocity of flow through runner as constant is given by [8].



PTO.

12.1

Where a = guide blade male 0 = ranser vanc angle at inlet The turbine is having radial discharge at outlet

 h) A Francistrathine with an overall officiency of 75% is required to produce 148.25 %W power. It is working under head of 7.62m. The periphend

velocity is $0.26\sqrt{2gn}$ and the radial valocity of flow at inlet is $0.96\sqrt{2gh}$.

The whoell runs at 150 rpm and hydraulic losses in turbing are 22% of available energy. Assuming radial discharge. Determine

- 6 The guide blade angle.
- in The wheel vane engle at inlet,
- fit) Width of conner at leftet.

阁

$OR \sim$

- c) The hub diameter of Kaplan torbine, weeking under a head of 12m is 0.35 times diameter of rinner. The turbine is running at 100 spin. If the vare angle of extrone edge of summer at eacher is 15° and flow catin is 0.6 find
 - i) Dissector of turner.
 - i) Diameter of buss.
 - B) Discharge (wong) summer-

[8]

(03) a) Explain with nest sketch various heads in case of a centrifugal pump.

[8]

- b) Write shart neves (any two):
 - Unit quantities.
 - ii) Performance curves for pumps.
 - iii) NPSH and MPSH.

OR_{-}

- a) 0 A courifogal pomp with 1.2m diameter runs at 200pm and purgat 1.88 mVr. The overage lift being 6m. The angle which the vane makes at exit with the tangent to impeller is 26° and robiol velocity is 2.5 m/s. Determine the monomeric efficiency and least speed to start pump. If the inner diameter of impeller is 0.6m. [5]
 - Two geometrically similar pumps are raticing at the same speed of 1000 rpm. One pump has an impeller diameter of 0.30 m and lifts water at the rate of 20 liftsee against a head of 15m. Determine the head and impeller diameter of the other pump to deliver half the discharge. [5]

17.01

Q4) a) Prove that the minimum work required for a two stage reciprocating air compressor with complete intercooling in [8].

$$W = 2 \times \frac{n}{n-1} \times p_1 v_1 \left(\frac{p_1}{p_1} \right)^{\frac{n-1}{2n}} - 1$$

Where, p. = pressure of air enturing the low pressure cylinder,

- v. volume of the Low pressure cylinder
- $p_j = \text{pressure of air leaving high pressure cylinder}$
- b) Write short notes on any two
 - Classification of recipcocating compressors.
 - Derive expression for workdone by reciprocating congressor with elearning congressor with
 - ii) Different efficiencies of reciprocining air compression.

OR:

- () Solve following two problems:
 - B A single acting reciprocerting air compressor sacks are at thir with temperature 27%. After delivery stroke, pressure of compressed air is 8 ber when compressor runs with 100 cpm. The compressor has cylinder dimension of 20 cm and stroke length of 30 cm. Take R = 287 J/kgK.

Compare the indicated power of compressor when compressor [5]

- Polytrupic compression with n = 1.25, and
- Adiabatic compression.
- Calculate the minimum work required to compress 1 kg of air from 1 bar at 27°C to 16 bar in two stages, if the law of compression is pv ¹³ = C and assume intercooling is perfect. Take R = 287 J/kgK. [5]
- Q57 (i) Describe briefly with a next sketch the axial flow compressor with its velocity diagram. Also define degree of reaction for axial flow compressor, [8]

b) A contribugal Compressor delivers 60 kg of all per minute at a pressure of 2 bar and 100°C. The lotake pressure and temperature of the air is 1 bar and 15°C. If no beat is keet to surrounding, find [8]

- i) Index of compression
- i) Power required, if the compression is isothermal
- Warlotone by compressor, if the compression is iserstropic.
- This R = 287 J/kgK and Cp = 1kJ/kgK

- c) A centrifigal air compressor receives air at a pressure of 1 bar and 18°C and delivers is as a pressure of 6 bar. Determine workdone by the compressor per kg of air delivered and heat exchanged with the jacket water when compression is
 - i) Isethermal.
 - ii) Isentropic.
 - ii) Follows law pv1. constant.

Write comparent on results. Toke Cp = 1 k3/kgK and R = 287 J/kgK. [8]

- (26) a) Which are the methods of improving the specific output and thermal efficiency of gas turbine? Explain Open cycle Gas turbine with Intercooling in details.
 - b) In gas turbine plant, air outers the compressor at 100 kb/cm³ and 15°C. The pressure ration is 5:1. The temperature at the inlet of the tarbine is 800°C. The mass flow rate is 10kg/s.
 - Calculate
 - The compressor power and turbine power.
 - ii) The ratio of turbine work to compressor work.
 - ii) The thermal officiency

Take $C_0 = 1$ kb/KgK and $\gamma = 1.4$.

OR

- c) Closed cycle gas turbine using air as working medium is operating under following conditions:
 - Atmospheric temperature = 26%.
 - D Maximum temperature = 870°C.
 - iff) Initial Pressure of compressor = 1 her:
 - (v) Final Pressure of compressor = 5 has.
 - vi Turbine efficiency = 0.84.
 - vi) Compressor efficiency = 0.8,
 - vii) Calorific value of fuel = 41840 kJ/Kg of fuel.
 - viii) Efficiency of heater = 0.9.
 - bd) Cp=1.005 kJ/kgK.
 - x = 1A
- Calculate:
- Compressor work and Turbine Work.
- 3) Fuel-Airmito.

- Heat Supplied.
- Thermal Efficiency.
- 为 戎 戎 - 4

[34]

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8 - 376 Total No. of Pages (2

S.E. Mech. (Semester - II) Examination, May - 2015 MACHINE TOOLS Sub. Code : 43595

Day and Date : Tuesday, 12 - 05 - 2015 Time : 10.00 a.m. to 1.00 p.m.

, Total Marks (190

Seat No.

Attempt any three questions from each section. instructions: 10

> 2bFigures to the right indicate full marks.

31 Draw neat skotches wherever percessary,

SECTION-1

$Q\eta$	n) (Draw block diagram of centre lathe. List and explain various operations on it [8	K,
	b)	Explain in detail my one method of taper turring on lathe machine. [8]	
(22)	n)	Explain principle of metal cutting. Describe onlongonal and oblique rating [8]	I,
	b)	Explain various turret tool holders with next sketch. [8]	
Q3)	a)	Classify drilling muchines. Describe various operations carried on by drilling machine.	
	6)	Esplain working of vertical boring machine with neut sketch. [8]]
24	Wr	ite short notes (any three)	
	8	Crank and slotted lick quick return mechanism.	
	b)	Hydraulic rhaper	
	ю.	Turret indexing mechanism	
-	đ)	Table drive and feed mechanism in planer	

P.T.O.

SECTION - II

29.45	Explain with near sketch-	different types	of milling c	UCCES:	181
65	Describe various operation	ess performed.	oo milling r	eachios.	[8]
Q(Q = 2)	Explain Sollowing terms i	ngrisding.			181
	ij Meanting	-0	Glasing		
	iii) Londing	149	Trising		
ь)	Explain various bonds as	ed bounding pro	cesses for (grindling wheels:	[8]
Q7) io	Explain construction and	working of Ch	(C muchline	s with block day	
b)	Describe various gear fir	ishing process	es,		[8]
Q8) We	ie shart notes (any three)				[18]
ž()	Broaching operations				
b)	Centroloss grinding				
c)(Gear shaping				
d3	CNC maling				
		999			

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25

Scot No.		S - 1311 Youd No. of Pages : 2
S.E	(Mychunical) (Revised) (Part-II) (Semester- May 2015 MACHINE TOOLS AND PROC	
Time ; J	Sub. Code : 63364 Date : Thursday, 14 - 05 - 2015 2.08 a.m. in 01.00 p.m. (1001) [] All quartism are compolence. [] Pigners to the right indicate full marks. [] Assume suffiche date, if accessary. [] Use at Nex- programmable Scientific Cal	Tural Marks : 100
20.4	What are the maps involved in casting process? various fields.	State its applications in [8]
61	Explain construction & working of but chamber OR	de catting process.[8]
	Describe with mut slatch investment casting pr	ocess. [8]
227 e) b)	Name different types of willing wills and con- rolling with typical aggitestions. Compare the following. () Cost working and hot working. () Calendaring and therato locating ())	tions any two types of [N] [N]
	List different types of core making machines a fiters with near skietch.	and explain any one of [8]
est wri ed b) c) d)	te a short noor on (Any Thees) Continuous custing Electric are Former Defects in Forging Importion of caning	[ES]

6

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ETO.

S - 1311

118}

Q4)	<i></i>	Calculate the gear train for cutting the 25 TPT pitch on work piece lead screw of lathe is 4 TPL. The lathe is supplied with 6 change ge from 2016120 teeth in steps of 5 teeth and an additional gear of 127.	199-92
	89	A little is provided with a change gror sor from 20 to 125 teeth in of 5 teeth and an additional groe of 127 teeth. Find the gror true cutting esetric thread of \$ 25 mm pitch on a latte having lead scrow as 6 TPL.	in Rit-
	1	With next sketch explain turnet indexing Mechanism.	181
		DR.	
		Compare namet lathe with centre lather.	8]
(25)	512	What are various job milding devices on milling machine?	181
	14	Expitain with next sketch the quick return mechanism of sluper	[8]
		ÖR	
		How are planers classified? Side functions of principal parts of place	er.[8]

Q6) Write a shart note on. (Any Three)

- u) Gunr Hobbirg
- b) Electro-chessical machining
- c) Radial Drilling Machine
- d) Various operations on milling mechine

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346

Tatal No. al Pages : 2.

Seat 4598 N(c)

S.E. (Mechanical) (Part - 11) (Semester - IV) Examination, May - 2015

METALLURGY

Sub. Code: 43594

Day and Date : Saturday, 09 - 05 - 2015

Total Marks : 160

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

Attempt any three questions from each section. Instructions : 11

Figures in the right indicate marks to that question. 21

Draw next detrikes wherever necessary, 21:

Assume suitable data if preciseary, 46

SECTION - I

(21) Draw next self-explosatory sketches of the following (any firm):

Microstructure of 0.4% carbon steel. 63.

Eussectic system plusse diagram. bb

Microstructure of Nedular cast iron. \mathcal{O}

Stress strain curve for mild steel and cast from-(D)

Dye penetrant test procedure. 65

Explain in detail from-from Carbide Equilibrium diagram, along with all Q2Vmthe reactions, plasses, and temperatures. 621 $\{6\}$

Explain magnetic particle test in detail. 161

Draw new sketch of Cu-Zn equilibrium diagram and explain different 031 10 181 types of brasses.

Explain in detail the procedure to draw equilibrium diagram by thermal b)e 81 analysis method.

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

- Ni-based alloys. 66.
- b) Coring.

Gibb's phase role. 63.5

S.G. iron. 35

Solid solution. eh

1161

11.61

1000

1161

SECTION - II

(25)	$\langle 0 \rangle$	Explain with neat sketch the transformation of Austenite t	
	b)	Explain tempering heat treatment along with the structural du- in it.	anges involved [0]
	(0)	Explain mechanism of quenching and quenching boths.	[4]
1	Co	ropare the following (any four):	[16]
	$\dot{0}$	Austempering and Martempering.	
	b)	Bainite and Mastensite.	
	(2)	Annealing and Normalizing.	
	d)	Nitciding and Cyuniding,	

- e) Impregnation and Infiltration of powder compacts.
- (Q7) a) What is annealing heat treatment? Montion the purposes of annealing.
 (S) Explain any two types of annealing in detail.
 - Explain the procedure to draw CCT diagram for 0.8% carbon steel. Compare CCT diagram with TTT diagram.

(08) Write short notes on (any four):

- a) Methods of powuler manufacturing.
- b) Controlled atmosphere.
- c) Salt-bath fumuce.
- d) Flow chart for manufacturing of diamond imprograted tools.
- e) Heat treatment defects and remediats.

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1.24

8 - 374

Total No. of Pages : 3

S.E. (Mechanical) - IV Examination, May - 2015 NUMERICAL METHODS

Sub. Code : 43593

Day and Dute : Thussday, 07 - 05 - 2015

Total Marks : 100

Time : 10.50 a.m. to 01.05 p.m.

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

Figures to the right indicates full marks.

20 Assume any additional data regained and state it clearly.

SECTION - 1

- Q(I) a) Apply method of Bisection to find the root of the equation cos r = r.e^{*}. Carey out six iterations. [8]
 - (b) Find root of the equation x log_g x = 1.9 correct up to three decimal places by Secant method. [8]

(22) a) Apply factorization method to solve following equations [8]

3x+2y+7z=4,2x+3y+z=5,3x+4y+z=7

Carry out six iterations to solve following equations

 $\begin{array}{l} 10x_{1}-2x_{2}-x_{3}-x_{4}=3\\ -2x_{1}+10x_{3}-x_{3}-x_{4}=15\\ -x_{1}-x_{2}+10x_{3}-2x_{4}=27\\ -x_{1}-x_{2}-2x_{3}+10x_{6}=-9 \end{array}$

The Gruss Seidal iteration method.

P.T.O.

381

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8-374

161

Q37 ii) The following values of x and y are supposed to follow the law y = ax² + b log₁₀x. Find the most probable values of constants a & b using method of least square.
[8]

x 2.85	3.88	2.66	5,69	6.65	3.77	8,67
v 167	26.4	35.3	47.5	60.6	77.5	95.4

 b) Determine f(x) as a polynomial in x for the following data and evaluate f(9) using Newton's divided difference formula. [8]

c	-4		0	2	5
/(x)	1245	Б	5	9	1335

O40 ab Calculate the mean and standard deviation for the following:

Size of acm.	0	1	1.1	9	-10	11	12
Frequency	3	6	40	13	8	3	4

- What are applications of Binomial distribution and Puisson distribution? [6]
- c) Box A contains 2 white and 4 black balls. Acother box B contains 5 white and 7 black halls. A ball is transferred from box A to the box B. Then a ball is drawn from the box B. Find probability that it is white. [6]

SECTION - II

- QSJ a) Evaluate $\int_{ax}^{1.5} e^{-x^2} dx$ using the 3 point Gaussian quadrature formula. [8]
 - b) The velocity v of a particle at distance v from a point on its path is given by the table balow. Estimate the time taken to travel 600 by using Simpsons 1/9st rule. Compare the result with Simpsons 3/8th rule. [8]

8 (83)	6	19	20	30	40	-50	-80	
v (ft/sec)	47	-58	64	68	61	52	38	

(26) a) Using Range - Kutta method of fourth order, solve for y at x = 1.2, 1.4

from $\frac{dy}{dx} = \frac{2xy + e^x}{x^2 + xe^x}$. Take initial values of x and y at 1 and 0 respectively. 181

- b) Solve by Taylor series method of third order the equation $\frac{dy}{dx} = \frac{x^2 + (x)^2}{x^2}$. y(0) = 1 for y at x = 0, 1, x = 0, 2 and x = 0.3. [8]
- (07) a) Classify the following equations:
 - $= 1) = \frac{\partial^2 u}{\partial x^2} + 4 \frac{\partial^2 u}{\partial x \partial y} + 4 \frac{\partial^2 u}{\partial y^2} \frac{\partial u}{\partial x} + 2 \frac{\partial u}{\partial y} = 0.$
 - $(0) = x^2 \frac{\partial^2 u}{\partial x^2} + (1 y^2) \frac{\partial^2 u}{\partial u^2} = 0$, given that $-\infty < x < \infty, -1 < y < 1$.

ii)
$$(1+x^2)\frac{\partial^2 u}{\partial x} + (S+2x^2)\frac{\partial^2 u}{\partial u \dot{u}} + (4+x^2)\frac{\partial^2 u}{\partial t} = 0$$
.

b) Solve u_{se} + u_{se} = 0 over the square mean of side 4 units satisfying the following boundary conditions: u(0, y) = 0 for $0 \le y \le 4, u(4, y) = 12 + y$ for $0 \le y \le 4; u(x, 0) = 3x$ for $0 \le x \le 4, u(x, 4) = x^3$ for $0 \le x \le 4$. Carry [32]out three iterations.

O8) Write short note and

- Types of elements in FEM. 10
- Crank Nicolson method. $M_{\rm e}$
- c) Variational and Galerkin's method.
- d) Implicit and Explicit method.

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-34

[16]

161

S = 374

P - 343 Total No. of Pages : 4

Seat No. S.E. (March.) (Point II) (Read

S.E. (Mech.) (Part - II) (Revised) (Semester - IV) Examination, April - 2016

ANALYSIS OF MECHANICAL ELEMENTS Sub. Code : 63361

Juy and Date : Wednesday, 28 - 04 - 2016 Time : 18.30 a.m. to 1.39 p.m.

Total Marks : 109

Instructions: 1) Attempt all questions.

- 2: Fogures to right indicate fall marks.
- 3] Draw next labeled skytch whetever precisiony.
- 4) Assume solitable data, if an exactly and state chearly.
- 5) Dee of non-programmible gales/atter is allowed.
- (20) (i) A compound tube consist of a storl tabe 140 mm internal diameter and 160 mm external diameter and an outer brass tabe 160 mm internal diameter and 180 mm external diameter. The two bars are of same length. The compound tabe carics axial load of 900 kN. Find stresses and head earlied by each tabe and size elements. The length of each tabe is 140 mm.

Take : E for steel = 2 × 10⁹ N/mm²; E for beass = 1 × 10⁷ N/mm², [12]

 Explain important points of stress strain curve for ductile and heittle material with near sketch.
 161

OR

b) Determine diameter of solid shaft which will transmit 90 kW at 160 rpm. Also determine length of shaft if the twist must not exceed 1° over entire length. The maximum share stress is limited to 60 N/mm². Take modulus of rigidity as 8 = 10° N/mm².

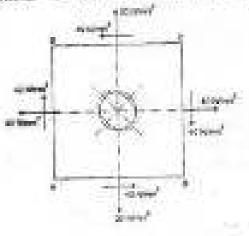
ETO.

P = 343

Q2) A beam ABCD is simply supported in point B and C as shown in fig. The Beam carries UDL of 9 kN/m over its entire length. A subcontrated lead of 20 kN m A and concentrated load of 40 kN midway between B and C. Draw shear force and bending moment diagram. Also force point of contraflecture [16]



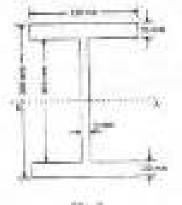
- (20) A been has an 5 section with upper flange 88 × 40 mm, web 120 × 20 mm and lower flange 160 × 40 mm. If would strike is not to exceed 30 Nimmi and compressive strake is not to exceed 90 Nimmi, what maximum UDC, the beam one carry over a simply supported span of 6m. If larger flange is to be [16]
- Q49 a) Derive the expression for principal stresses and maximum shear stress for a member subjected to like direct stresses in matually perpenditular directions. Also give the locations of principal planes and planes of maximum shear stress.
 - b) On a mild steel plate, a circle of diameter 50 mm is drawn before the plate is stressed as shown in Fig. 1. Find the lengths of the major me minor axes of an allipse formed as a result of the deformation of the circle marked. Take E = 2 × 10° N/mm² and 1/m = 0.25.





-25

b) An L section beam 350 mm = 150 mm has a web thickness of 10 mm and a flange thickness of 20 mm. (Fig.2). If the show force acting on the section is 40 kN, find the maximum short stores developed in the I-section. Also, sketch the shear stress distribution across the section.



83g(2)

- Q5) a) Derive the expression for slope and deflection of a creatilever subjecter to uniformly distributed load (UDL) using double integration method (UDL for whole length).
 - F) A cantilever AB 3 m long is subjected to a downward force of 60 kN am an anticlockwise couple of 108 kN-m at the free end as shown in Fig-3. Determine the slope and the deflection at B. Take EI = 9 × 10⁹ kN/m² Use Moment area Method.





OR .

 b) State the importance of theories of failure and explain the maximum principal stress theory.

- [96] a) A straight both ends hinged column is 50 mm in diameter and 1730 mm long. Calculate
 - () Euler's is ippling load when loaded axially.
 - Take E = 2 × 10⁵ N/mm³.
 - b) Find the deflection at the centre of a simply supported beam of spin 1 earlying a UDL of w per unit run over the whole spin, using energy theorem. Assume uniform flexural rigidity. [8]

P - 344

Tutal No. of Pages : 4

Sect. No.

S.E. (Mech.) (Part - II) (Semester - IV) (Revised) Examination, April - 2016

FLUID AND TURBO MACHINERY Sub. Code : 63362

Day and Date : Friday, 22 - 04 - 2014

Total Marks : 100

881

Three: 10.50 mm. to 1.30 p.m.

instruction (1) All quantion are compalieny.

- 2) Figures to right tradicate 5.01 marks.
- 31 Assume spinsible data if measurery and helicate clearly.
- 4) Use of use-programmable calculator is allowed.

Q11 (a) Derive Enter's oppositue for work done in rotory semic mechines. [8]

- (c) Design a Petion wheel for following the
 - Net head ~ 200m.
 - in Power to be developed = 250 kW
 - iii) Secol = 360 rpm
 - is) Decall efficiency 90%
 - Coefficient of notaria 0.96
 - Speel ratio = 0.47

OR.

c) A unifore works under head of 200m and it develops 5000 kW at 200 rgsn. The overall efficiency is 87%. Find its unit quantities. A model is to be built which is similar to above turbine in all respect having the scale 1; 10 is its tested under a head of 20m. Find speed, discharge and specific steed of model. [8]

(Q2) (a) Draw a subernatic diagram of Kapius turbine and explain its working.[8]

(b) 233 liters of water per sec is supplied to an inward flow reaction turbine. The head available is U.m. The wheel visits are radial at inlet and infet diameter twice the outer diameter. The velocity of flow is constant and is equal to 1.83 at/3. The numer makes 370 rpm find.

P.T.O.

 $\mathbf{R} = 244$

- i Christevane scole
- ii) Internationlei domour
- 10 With a interned outlet.

Assume electrony: is radial and neglect the thickness of struc. This speed min(q) = 0.7 [8]

 $OR_{\rm e}$

- A turbine operate under head of 25m at 256 rpm and tests a discharge of 10m?/see with overall efficiency 0.85. Find
 - 1) Power developed
 - i) Specific spece
 - (i) Performance of turbine under beach of 20m
 - iv) Type of tarbine
- 20 a) Explain the concept of minimum starting speed of the contribution [8]
 10 also derive its formula
 - b). Write short notes (any two)
 - h Model using of semilling at pany
 - i) Paming of pumps.
 - if: Cheracteristics curves of pump

OR.

- (b) (b) A coordifical pump baying otter diameter of impeller equal to two innestinger diameter and running at 1000 quin, work against the total head of 40 in. The velocity of flow (hough the impeller is constant and equal to 2.5 m/s. The values are set back in angle of 40° at outlet. If the outer diameter of impeller is 500 runn and width at outlet is 50 run, find [5].
 - 1) Vate angle at mini-
 - Work done by impellize on water per sec.
 - 3) Manomark efficiency.
 - ii) A single stage combilingst pump with impeller diameter as 30 cm rotates at 200 ppm and 10ts 3 m² of water par sec to a beight of 30 m with an efficiency of 75%. Find Number of stages and diameter of each impaller of a similar multistage pump to 100.5 m² of water per sec to a bright of 300 m when rotating at 1500 ppm. [5].

- (24) (i) Explain the effect of clearance volume on reciprocating compressor with the help of P-V diagram and beace, define volumetric efficiency of compression. Berryg expression for work done by reciprocating compressor with clearance volume. 181
 - [b]. Write shurt totes on any barr;

1101

- Construction and Working of vane blower. Π.
- Difference between reciprocating compressor and relary compressor. Đ.
- (i) Multistage reciprociting alr compressor with and without intercooler.
 - nie.
- c) Sube following two problems :
 - A single stoge single acting compressor delivers J4m³ of free air ъ., per minute form I har to 7 har. The speed of compressor in 310 pm. Assuming that compression and expension follow the law paths = constant and alegranic is 5% of the resent volume. End Volumetric efficiency and Swept volume. Take L =1.5D. The teroperature and pressure of air at the station are same as atmospheric 151 titi i
 - A single stage reciprocating air compressive is required to compress air thorn 1 har to 8 hur. The initial temperature is 27°C. Colealate ourse requirement it isofactual compression per util mesa of the Take R= 287 L/kgK. Also define lanthermal efficiency of 151 reciprocating compressor.
- Q5) a) Explain the construction of centrifugal compressor along with velocity. triangles and write equations for work dote by centrifugal compressor for different compression processes. 189.
 - b) A contribugal air compressor compresses the air from 1 has to 4 har. improved outer diameters of the impeller are 0.2 m and 0.4 m respectively. The impetter blarle angle at lober and exit are 35° and 40° respectively. An enters the impeller blace radially at a speed of 15 m/s, Datennine,
 - Speed of impeller in tora ω.
 - in Work drite per kauf air
 - is) Thickness of the impeller blodes for a mass flow rule of dr as 0.5 kp/ if the impeller has 30 blades and width of each impeller blade is 5.5 cm. Assume the specific volume of air as 0.82 m³/sg and velocinof flow is constant. $[\mathbf{Z}]$

Take Cp + 1 005 kD4g K and y = 1.4.

1.84

 An axial flow compressor with compression ratio as 5, draws air at 20° E. deflyers it at 50° C and rotate with blade velocity 100 m/s. Assuming 50% degree of reaction. Deservine,

Velocity of Bow

Number of stopes 101-

Take work factor is 0.85, $\alpha = 10^{\circ}$, $\beta > 40^{\circ}$, Cp+1 k3Ng K [N]

- (26) (a) Explain working of closed cycle gas tarbine with reheating along with T-s-disgram.
 - b) In an oil gas to bong installation, his is taken at 1 har and 30°C. The air is compressed to 4 bar suff then leated by branting fire all to temperature of 500°C. If the oil flows at the rate of 90 kg/min, find the power developed by plant. Take y = 1.4 for air and Cp = Halling K. 172.4 kg of oil having calorific value of 40000 kl/kg is burn in the combination chamber per minute, find out work done by nabline in 5%. 13%

OH.

eb - In constant pressure open cycle gas turbing, air enters at I har and 20°C and leaves the compressor at 5 has Using the following data:

Temperature of parses watering the turbing = 680% 18

Pressure isss in the combustion chamber = 0.1 ber ÷1

ii) Compressor ifficiency = 85%

(c) Turbine efficiency #80%s

Combustion Chumber efficiency = 85 %

 $x_{\rm H} = 1.4$

vity Cp = 1.024 k3/kgK for alr and pm

Wind the quantity of oir circulation of the plant develops 1065 kW, Moss of foul may be neededed.

P = 345 Tatal No. of Pages: J

Total Marks : 100

S.E. (Mech.) (Part - II) (Revised) (Semester - IV) Examination, April - 2016

THEORY OF MACHINES -1 Sub. Code : 63363

Day and Date : Sunday, 24 - 04 - 2016

Time : 9.30 a.m. to 1.30 p.m.

Scat

No.

Instructions: 1) Attempt all questions.

Figures to right inducate fell morks.

Draw tical labeled skatth wherever necessary.

4) Assume suitable data, if weekstory and state clearly.

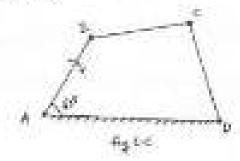
5) Use of non-programmilite calculator is allowed.

Q(1) () Explain the inversions of double slider cank chain with near sketches.[8]

OR^{2}

The driving shaft of a Hooke's joint rotates at a uniform speed of 500 np.m. If the maximum variation in the speed of driven shaft is a4% of the speed of driving shaft, determine the greatest permissible angle between the shafts. Also find the maximum and minimum speeds of the driven shaft. (5)

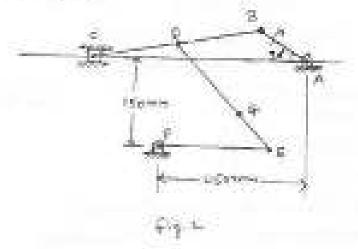
b) In a four-bar muchanism shown in fig. 1.c, AB = 300 mm, BC = CD 560 mm and AD = 600 mm. The orank AB rotates uniformly at 150 n.p.m. Locate all the instantateous centers and find the angular velocity of link BC. [8]



BTO:

P = 348

QD In a mechanism as shown in fig.7, the link AB courses with uniform angular velocity of 30 rad/s. The lengths of various links are + AB = 200 mm BC = 200 mm, BD = 150 mm, DE = 250 mm, EF = 200 mm, DG = 155 mm Determine the velocity and acceleration of slider at C and point G for the given configuration. [18]



(27) a) Derive the equation for friction tongut in case of flat pivot beining assuming uniform were with usual notations. [8]

OR!

Derive the equation for fliction torque in case of conical pivot bearing assuming uniform pressure with usual notations. (8)

- b) The thrust in the marine engine is taken up by multi-colland shaft and is equal to 150 kN. The speed of the shaft in 90 μ.μ.α. Assuming uniform pressure equal to 0.3 N/mm² and if the outer diameter is 1.5 times the inter diameter, find the internal and external diameters of the collar. Also find the number of collars required if the power lost in friction is not to exceed 15 kW. Take μ = 0.05. [8]
- Q40 a) With the help of sketch, define Trace point and Pressure angle is case of usin.
 - b) Draw the profile of curn to give the following motion to the astillating roller follower.
 - D Follower to move outwords by an angular displacement of 30° during 120° of some rotation.
 - Follower to dwell for 30° of case relation at the end of ostward stroke.

- Follower to return to the initial position during the 120^e of can rotation.
- w) Follower to dwell during next 90° of case retation.

The distance between pivot of oscillating follower and cuit axis is 11: mm. The effetance between pivot and roller follower center is 140 mm Minimum radius of care is 50 mm and roller radius is 10 mm. The ou strate and retarn strate is executed with \$50M. [14

- Q59 a) An open belt drive transmits 2.5 kW power. The linear velocity of belt is 2.5 m/s. The angle of lap on smaller palley is 165° and coefficient of friction is 0.3. Determine the effect on power transmission in the following uses : 1101
 - 0 initial tension in the belt is increased by \$14.
 - Angle of lap is increased by 8% for the same speed and tension on the tight side.
 - EI) Coefficient of Eletion is increased by 8% by suitable dressing to the friction auction of the beit and initial tension is same.
 - b) Explain alip and creep of helt.

OR-

Explain rope brake dynamometer with neat sketch.

- Q49 a) In a spring loaded Hannell type governor, the extremu radii of rotation of the halls are \$0 mm and 120 mm. The ball arm and shorve arm of the bell srank lever are equal in length. The mass of each ball is 2 kg. If the speeds at the two extremu positions are 400 and 420 mm, find the initial compression of the extremu positions are 400 and 420 mm. Neglect weight of shorve. [10]
 - b) Explain Effort and power of the poverous.

02

Explain porter governor with the help of neat diagram.

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P = 34t

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P - 346 Total No. of Pages : 2

Total Marks: 800

No.

Day and Date : Toesday, 26 - 64 - 2016

S.F. (Mechanical) (Part-II) (Semester-IV) (Revised) Examination, April - 2016

MACHINE TOOLS AND PROCESSES

Sub. Code : 63364

110062-102	ie a.m. in within Jum.	
lastruction	 All questions new sampalarty. Figurm to the right indicate full marks. Assume suitable data, if pressurely. Use of Non-programmable scientific calculator trailorend. 	
00.0	State the importance of costing as manufacturing process with its o	ana a
23012	and demerits?	85
65	Explain with next detch elements of galling system.	[8]
	OR	
6)	List different types of feel fixed melting furnaces and explain its induction furnace.	denail
(27) -12	With ness sketch explain open die forging & close die forging.	[8]
65	Compare the following:	[8]
	B Het working & Cold working	
	ii) Direct extrusion & Indirect extrastan	
	OR	
6).	Explain in detail wire drawing process	
23) We	e a short note on (Any Three)	[18]
3)	Pressure dis-casting	
63	Crucible furnage	
- 63	Defects in Extrusion	
d2	Directional Solidification	
		17.0.

P - 346

	A3	
<u>9</u> -9 ×)	Calculate the gear train for outting size 8 TPI pitch on work piece Imai acrow of lathe is 4 TPI.	e if the [3]
	The lathe is supplied with a change gear set from 20 to 120 teets 1 of 5 with and an additional gear of 127 teeth.	n steps
62	A lathe is provided with a change gear set from 20 to 120 teech a of 5 totih and an additional goar of 127 teeth. Find the gear to rutting metric thread of 3.25 mm pitch on a lathe having had serve as 6 TPC.	ain for
2]	 Draw block diagram of turns take. Name different parts & explain it of each part. 	inclien [8]
	OR OR	164
्म	Draw block diagram of tudial drilling machine and explain its work	ng (%)
Q57 3)	Describe the main features of the following milling machines.	[9]
220125	 Horizontal milling machine. 	- 225
	ii) Vertical neilling machine.	
	iii) Universal milling machine.	
(b)	What is the difference between shaper and planner?	[7]
	OR.	
16)	Describe sandard screesories used for milling muchine.	171
26 8	rite a short note on. (Any Three)	[18]
	Gear Shaping	
- 31	Wate: Jet marchining	
	Various operation of drilling machines	
	Hydriudio shaper	

P-835

Total No. of Piges (4)

Total Marks : 100

S.E. (Mechanical Engineering) (Semester - IV) Examination, April - 2016 APPLIED NUMERICAL METHODS Sub. Code : 63360

Day and Date : Sunday, 17-04-2010 Time : 10.30 s.m. to 1.30 p.m.

Seat. Not.

Instructions)

tions) 1) All praintiens are compulsors.

All questions are compulsory.
 Make notes to assumption-field if required and state clearly.

3) Draw next slotches wherever necessary.

- (i) Figures to the right indicate fall marks.
- 51 Use of epictumor is allow of.

 Q1) a)
 Explain approximate error with an example.
 [5]

 b)
 Solve any two
 [2 × 5 = 10]

- Find an approximate root of the equation xlog_{en} a = 1.2 which lies between 2 and 3 using False position method.
- Find the root of the equation x¹ + 2x² + 10x + 20 = 0 using Muller's method.

(Take $x_i = 0, x_i = 1, x_i = 2$).

iii) Evaluate 412 to four decimal places by Newton Rapham method.

Q2) a) Solve the following equations by Gauss - Elimination method. [5] 2x + 3y - z = 5 4x = 4y - 3z = 32x - 3y + 2z = 2

EEO.

bi Solve any tern

0 Solve the following equations by Gauss-Jacdon method.

x+2y-3z=4 12x+4y-6z=18x-2y+5z=4

is Solve the system of equations using LU Decomposition.

x+5y+z=142x+y+3z=13

3x+y+42=17

(ii) Solve the following equations by Gauss - Sectar method.

6x+15y+2z=72 x+y+54z=11027x+6y-z=85

Q31 Solve any first!

$[4 \times 5 = 20]$

P-835

 $[2 \times 5 - 10]$

a) The pressure and volume of gas are related by the equation PVⁿ + K (), and K are constants). Fit this equation for the following fora using principles of loss squares.

p ::	0.5	1	1.5	2.0	2.5	2.0
v.	1.62	1,00	0.75	0.62	0.52	0.45

 b) Caing Lagrange's interpolation formula, find y(10) from the following sable

8	i - £	26	.9	11
1	1 12	13	14	16

d) Find the mean, median, mode and standord deviation of following:

15, 21, 21, 21, 25, 30, 35.

d) Using Newtons divided difference formula find f(6)

x 1 1 2 7 8 y 1 1 5 5 4

State and prove addition and multiplication law of probability.

Q4) Solve my throut

[3×5=15]

- (a) Evaluate the integral $I = \int x^4 dx x \sin y$ Simpsons 1/3" Bule.
- b) Use Romburg's method to evaluate $\int_{0}^{12} \frac{dx}{(1+k)}$ take b = 0.6, 0.3, and 0.15.

(c) Evaluate $\int_{0}^{0} (3x^{2} + 2x + 3) dx$ by Gaussian Quatrature.

 A jet fighter position on an aircraft carriers ranway was timed during landing

1(3033)	1.9	1.1	1.2	1.7	3.4	1.5	1.5
X(m)	7.989	8.403	8.781	9,129	9,451	9.750	0.031

Where X is the distance from the end of the catrier. Estimate velocity and acceleration at t = 1.1 sec-

Q5) Solve any three

[3×8=15]

(i) Using Range Kuita method of fourth order find y at x = 0.8 if y' = y = 3. Given y(0.6) = 2.7370 take h = 0.1.

- b) Find the eigen values and corresponding eigen vectors of $\begin{bmatrix} 6 & -4 \\ 2 & 2 \end{bmatrix}$ by both power method and polynomial method.
- c) Given the houndary value problem $\frac{d^2y}{dt^2} = 6x + 4$, y(0) = 2, y(1) = 5obtain its solution in the range $0 \le x \le 1$ with h = 0.25 using finite difference method.
- d) Solve dy/dx = 1 + sy : given y(0) = 2. Obtain the values of y(0.1), y(0.2) and y(0.3) using Picord's method.
- Q6) a) Solve $U_{x} + U_{y} = 0$ in the square region bounded by x = 0, x = 4, y = 0, y = 4 and with boundary conditions:

 $n(0,y) = 0; n(0,y) = 12 + y; n(x,0) = 3x; n(x,0) = x^2.$

by Liebmann's method. Take $\Delta x = 1$, $\Delta y = 1$, Perform two iterations, [10]

- b) Classify the following partial differential equations: [5]
 - $0 = U_{a} + 2U_{a} + U_{a} = 0.$
 - 1) $xU_{x} + yU_{y} = 0; x \ge 0, y \ge 0.$
 - $ii_1 = U_{i_1} 2U_{i_2} = 0$,
- c) Explain explicit method with a near sketch.



[5]

P-850

Total No. of Pages : 2

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R	Contract of	Sec. 1.	 1000		1.00

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S.E. (Mechanical) (Part - II) (Semester - IV) (Old) (Pre-revised) Examination, April - 2016 MACHINE TOOLS Sub. Code : 43595

Day and Date : Thursday, 28-04-2016 Time : 10.30 a.m. to 1.30 p.m.,

Total Marks : 100

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

2) Figures to the right indicate full works.

J) Assume austable data, if necessary.

-0 Use of Non-programmable Scientific Calculator is allowed.

SECTION -1

Q1) ii)	Deaw block diagram of lathe. Name different pares. Seate the specificat of lathe.	ian [8]
- 61	Explain the following operations performed on latter.	[8]
	0 Turning	1005
	i0 Facing	
	 Knuding 	
	3) Dillog	
$\langle Q2\rangle$ (d)	Explain bar feeding mechanism in copstan lathe with next eletter.	31
.p]	List various tool helding devices used on drilling machine. Describe a	the Cold State of the State of
Q3) i)	Explain construction and working of jig buring machine with or skotch.	an Si
36.5	Wheel Total of Manager Annual Annual State	

What is the difference between shapes and planner? [8]

PTO

Q4) Write a short note on (Any Three);

classification of curting sool,

b) Victors Accessories used on drilling machine.

<) Automat.

VIII AND ADDRESS OF

d) Table feed mechanism in shaper.

SECTION - II

P-850

 $\{18\}$

Q29.40	the second second second and working of vertical million run delega	181
-30	Explain in detail gear coming or milling machine.	191
Q6) a)	Draw near skotch of milling cutters. State the application of each cutter,	
65	Explain the following terms is grinding.	181
37	9 Wheel mounting.	[8]
	ii) Wheel knoting.	
	iii) Wheet troing.	
	(v) Wheel glasting.	
Q7) a)	Explain working of CNC machine with block diagram.	
- b)	Describe gear hobbing process with new sketch.	[8] [8]
Q8) Wit	te a short note on (Any Three)	[18]
- 40	Tool and outter grindes	1100
- b)	Gear rolling.	
+	Types of CIMC machines.	
¢)	Various operation performed on broaching machine,	

er er er

-2-

S = 2074 Yutal No. of Pages : 4

No

S.E. (Mechanical) (Part - II) (Semester - IV) Examination, November - 2015 ANALYSIS OF MECHANICAL ELEMENTS

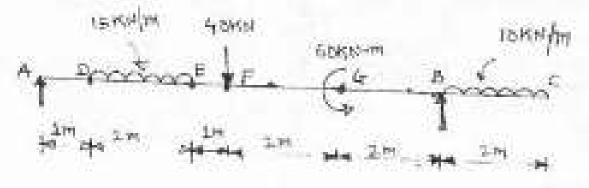
Sub, Code : 43592

Day and Date : Monday, 20 - 11 - 2015 Time : 10.00 n.m. to 01.00 p.m. Total Marks : 190

- Instructions: I) Solve any three questions from each section.
 - 2) Assume suitable data wherever necessary & state it clearly.
 - 3) Figures to the right indicates full marks.

SECTION - I

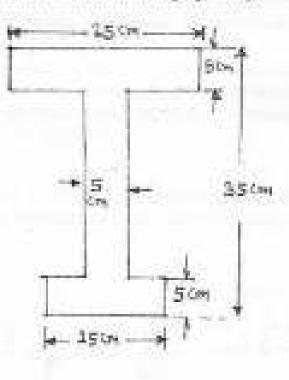
- (Q1) a) Draw stress atmin diagrams for ductile and brittle materials subjected to axial loading & explain the important points of the diagram. [6]
 - b) A steel bar 20mm in diameter is enclosed in a brass tabe of 25mm external diameter and 2mm thick. Assuming E₂/E₆ = 2 and initial lengths of both components are 400mm. Calculate stresses in steel and brass of the composite section which is subjected to an axial compressive force of 50 KN. Assume E₂ = 200Gpa. Find also change in length of composite section. [10]
- (22) Draw the shear force and bending moment diagram for the beam shown in figure - 2. Locate the point of max, bending moment and point of contraflexore. [18]



P.T.O.

11

- Q3) a) 500KW power has to be transmitted at 100rpm. Allowable shear stress is 75MPa for shaft material. [9]
 - Determine the necessary diameter of solid shaft.
 - Diameter of hollow shaft if the inside diameter is 0.8 times the outside diameter.
 - iii) Determine saving in material when hollow shaft is used.
 - b) The cross section of a simply supported beam is 'T' section with finge dimension 100mm is 50mm & web dimensions 100mm × 50mm. It is subjected order a bending moment of 3400N-m. Calculate the bending stresses in the beam & show it graphically. [7]
- Q4) A cost into bracket subjected to bending has a cross section of 1-shape with unequal flanges as shown in fig - 4-1. If the tensile stress in top flange is not to exceed 17.5 MPa, what is the bending assument the section can take? If the section is subjected to a shear force of 100 KN. Calculate the shear stress across the section and show it graphically. [16]



-2-

SECTION - H

(25) a) Explain Maximum shear stress theory.

- b) At a point, within a body subjected to two mutually perpendicular directions, the stresses are 100N/mm² (tensile) and 75 N/mm² (tensile). Each of the above stressess, is accomptined by stear stress of 75 N/mm². Determine normal, shear and resultant stress on an oblight plane inclined at 45° with the axis of minor unsile stress. [6]
- c) At a certain point in a strained material the streases on two planes at right angles to each other are 20N/mm² and 10N/mm² both tensile. They are accompained by a shear stress of magnitude 10N/mm². Find location of principal plane and evaluate principal stressers. [8]
- (26) a) Derive an expression for slope and deflection for a simply supported beam carrying point load at center. [8]
 - b) A cantilever of length 2m carries a UDL of 25KN/m at free end to 75 KN/m at fixed end. If H = 1 × 10⁴N/mm² and I = 10⁶ mm⁴ Determine the slope and deflection at free end. [8]
- (27) a) Define equivalant length of column. Give equivalant length of columns for various end conditions. [4]

b) Define slenderness ratio and state the limitations of Eulers formula.[4]

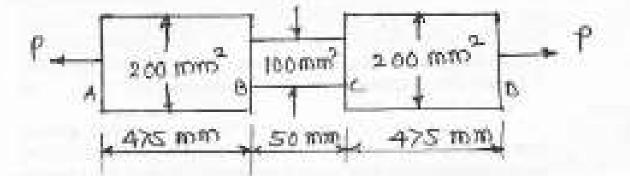
c) A hollow alloy tabe 5m long with external and internal diameters 40 mm and 25 mm respectively was found to extend 6.4 mm under tensile load of 60 KN. Find the burkling load for the tabe when used as a column with both ends pinned. Also find the safe load for the tube, taking factor of safety = 4. [8]

-34-1

[4]E

S - 2074

- Q8) a) Elerive an expression for strain energy stored in a body due to torsion. [8]
 - (b) The maximum stress produced by a pull in a bar of length 1m is 150N/mm². The area of cross section and length are as shown in fig. Calculate strain energy stored in a bar if E = 2 × 10⁹ N/mm². [8]



RHH

S - 2075 Total So. of Pages 13

Total Marks : 100

S.E. (Mechanical) (Part - II) (Semester- IV) Examination, December - 2015 METALLURGY Sub. Code : 43594

Day and Date : Wednesday,02-12 - 2015 Time : 10.00 a.m. to 01.00 p.m.

Seat. No.

Instructions : 1] Attempt any three questions from each section.

2) Figures to the right indicate marks to that question.

- 3) Braw near sketches wherever necessary
- 4). Assume suitable data if necessary

SECTION-I

Q13 Draw near self-explanatory sketches of the following (any four)

COMPACT CONTRACT

1161

161

- a) Microstructure of 6.8 % carbon steel,
- b) Isomorphus system phase diagram.
- c) Microstructure of grey east iron.
- d) Creep fracture.
- e) Ultrasonic test schip.
- f) Partial eutectic system phase diagram.

(Q2) a) Explain in detail from-Iron Carbide Equilibrium diagram along with all the reactions, phases, and temperatures. [12]

b) Explain fittigge test with nent sketch.

Q3) a) Draw next skews of Al-Si equilibrium diagram. With reference to equilibrium diagram explain the modification treatment.
 [8]

 Explain the procedure to draw equilibrium diagram from cooling curves [8] PT.O.

[16]

[16]

Q4) Write short notes on (any four):

- a) Ph-Sn Alloys,
- b) Imperfection in crystals.
- e) Solidification by nucleation
- d) a-Brasses.
- e) Standard Brinell Hardness test.

SECTION - II

Q51 nl	Define Heat treatment. Explain the basic steps of host treatment	t, and
	mantion the objectives of heat treatment.	[6]
-67	Explain in detail the transformation of Austimite to Martensite.	[6]
0)	Explain with next sketch any one type of Heat treatment furnace.	[6]

Q6) Compare the following (any four):

- a) Pearline and Bainitic transformation.
- b) Austempering and Martempering.
- c) TTT and CCT diagram.
- d) Flatte hardening and Induction bordening.
- e) Sizing and Compacting.

Q7) a) Explain the exchanism of precipitation bardening with suitable example. Which are the different alloys that can be precipitation hardened. [8]

(b) What is carborizing beat treatment? Explain in detail any one type, along with post carborizing heat treatment. [8] Q8) Write short notes on (any four):

- a) Heat treatment defects and remedies.
- b) Process annealing,
- c) Quanching baths.
- d) Methods of powder manufacturing.

....

c) Controlled atmosphere.

8 - 2075 [16]

S - 2076 Total No. of Pages : 4

Total Marks : 100

S.E. (Mechanical) (Part - II) (Semester- IV) Examination, December - 2015

THEORY OF MACHINES-1

Sub. Code : 43596

Day and Date : Friday, 64-12 - 2015 Time : 9.00 a.m. to 01.00 p.m.

Scat No.

Instructions : 1) Q.2 and Q.5 are compulsory, from the remaining questions of each section answer any two questions.

- Figures to the right indicate full marks.
- 3) Draw near labeled sketch wherever assessary.
- 4) Assume if necessary, suitable data and state clearly.
- 5) Use of Non programmable calculator is permitted.

SECTION-1

QU(a) Statch and explain the following with suitable examples:

- Lower pair and higher pair.
- Degree of freedom.
- b) What do you mean by inversion of mechanism? Ender the inversions of four ber chain, single slider crasic chain and double slider crask chain. [6]
- c) Duling instantaneous centre of location. What are their types, explain how to locate them with the help of neat skatch. [6]

Q2) The dimensions of the Andreau diffeomial stocke engine mechanism, as shown in Fig. 1 AB=80mm,CD=40mm,BE=DE=150mm, and EP=200mm. The block AB and CD are genred together. The apend of the smaller wheel is 1146 rpm. Determine the velocity and acceleration of the piston P for the given ocnfiguration. [18]

BEO.

F43

S-2076

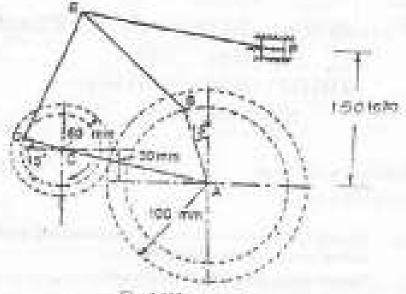


Fig. 1 (Non to scale)

- Q30 a) Sketch and explain pantograph. Show that it can be used to plot the drawings at enlarged and reduced scale. [8]
 - b) Derive the condition for equal speeds of the driving and driven shafts connected by Hooke's joint. [8]
- (24) a) Explain different forces acting on the reciprocating parts of an engine in detail. [6]
 - b) A connecting rod of an LC, engine has a mass of 2 kg and the distance between the centre of gudgeon pin and centre of grank pin is 250 mm. The C G falls at a point 100 mm from the gudgeon pin along the line of centres. The radius of gyration about an axis through the C.G. perpendicular to the plane of rotation is 110 mm. Find the equivalent dynamical system if only one of the masses in located at gudgeon pin.

If the connecting rod is replaced by two masses one at the gudgeon pin and the other at the erask pin and the angular acceleration of the rod is 23000 rad/s² clockwise. Determine the correction couple applied to the system to reduce it to a dynamically equivalent system. [10]

16E

SECTION - II

- (25) a) Derive the equation of maximum velocity and acceleration of follower moving with SHM. [4]
 - b) It is required to design the profile of a cam with oscillating follower for following motion;
 - Follower to move outwird through an angular displacement of 20° during 90° of cam rotation
 - Follower to dwell for 45° of cam rotation.
 - Follower to return to its initial position in 75° of cam rotation; and
 - (v) Follower to dwell for remaining rotation of cam.

The distance between the pivot centre and the follower roller center is 70 mm and the roller diameter is 20 mm. The minimum radius of can in such that follower arm is horizontal. The location of pivot point is 70 mm to the left and 60 mm above the cam centre. The motion of the follower is to take place with SHM during outward stroke and with uniform acceleration and retardation during setuen stroke. [14]

(96) a) Derive the equation for height of Parter governor.

- b) A threat bearing of a propeller shaft consists of a number of collars. The shaft is of 400 mm diameter and rotates at a speed of 90 rpm. The threat, on the shaft is 300 KN. If the intensity of pressure is to be 200 KN/m² and coefficient of friction is 0.06, determine external diameter of the collars and the number of collars. The power lost in friction is 48 kW.[10]
- Q7) a) What are different types of dynamometers? With near sketch explain belt transmission dynamometer. [6]

S - 2076

- b) A Hartnell governor has rotating masses of 1,4 kg carried on right angled bell crank levers, in which weight acm is 60 mm and sleeve arm is 50 mm long. The sleeve has total movement of 25 mm and is in mid position alceve arm is horizontal and masses rotates in circle of 80 mm radius. The maximum and minimum equilibrium speeds are 435 and 420 mm respectively. Determine - [10]
 - Maximum and minimum radius of rotation
 - ii) The stiffings of spring
 - iii) Initial compression of spring.
- (28) a) An open belt drive is used to connect two parallel shafts 4 m apart. The diameter of bigger pulley is 1.5 m and that of the smaller pulley is 0.5 m. The mass of the belt is 1 kg/m length. The maximum tension is not to exceed 1590 N. The coefficient of friction is 0.25. The bigger pulley which is the driver pulley also, rotates at 250 rpm. The speed of the driven pulley is 725 rpm. [10]

Calculate-

- i) The power transmitted
- ii) Power last in friction
- iii) Efficiency of the drive.
-) Write note on friction circle.

[0]

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S.E. (Mechanical) (Part - II) (Semester - IV) Examination, December - 2015

ANALYSIS OF MECHANICAL ELEMENTS (Revised) Sub. Code : 63361

Day and Date (Tuesday, 61 - 12 - 2015)

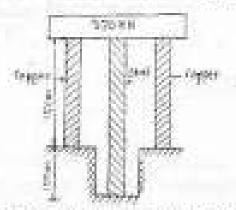
Total Marks (100

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

- Inconcettoris : ... 11 Attempt all questions. 21
 - Figures to the right indicate full marks to the question.
 - Draw next labeled sketch whenever necessary, 20
 - 41 Assume suitable data, if necessary and state clearly,
 - Use of non-programmable calculator is allowed. 51

A steel rod and two copper rods together support a load of 370kN as DD(w)shown in the Fig. The cross sectional area of steel rod is 2500mm² and of each copper rod is 1600mm². Find the stresses in rods,

> Take : E for steel = 2×10²N/mm²; E for copper = 1×10²N/mm² 112E



Define modulus of elasticity and modulus of rigidity. Also obtain relation 167 between them. [6]

692

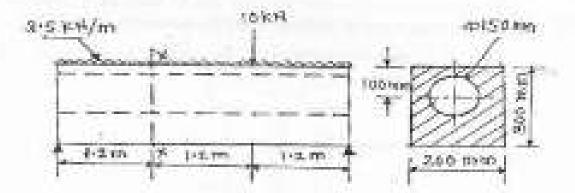
A solid shaft of 60mm diameter is to be replaced by a hollow shaft of **时**下 same material with internal diameter cousi to half of the external diameter. Find diameters of hollow shaft and saving in material, if maximum allowable shear strain is same for both shafts. 161

S - 2077

Q2) Draw shear force and bending moment diagram for a beam as shown in the fig. also locate maximum bending moment and point of contraffexture if any. [16]



Q3) A simply supported beam and its cross section are as shown in the fig. The beam curries a load of 10kN as shown in fig. Its self weight is 3.5kN/m calculate maximum bending stress at XX. [16]



- Q4) z) Derive the expression for principle stresses and maximum shear stress for a member subjected to like direct stresses in mutually perpendicular directions. Also give the locations of principle planes and planes of maximum shear stress. [9]
 - b) The intensity of resultant arress on a plane AB shown in Fig.1 at a point in a material under stress is 800N/cm² and it is inclined at 30° to the normal to that plane. The normal component of that stress on another plane BC is 600 N/cm²

198

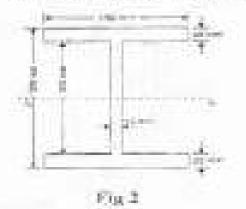
Determine

- the resultant stress on the plane BC.
- iii) the principle stresses and their directions.
- (iii) The maximum shear stresses and their planes.



OR^{-}

b) An I-section beam 350mm x 150mm has a web thickness of 10mm and a flange thickness of 20mm. (fig 2) If the shear force acting on the section is 40kN, find the maximum shear stress developed in the Isection. Also sketch the shear stress distribution across the section. [9]



- (25) a) Derive the expression for slope and deflection of a cantilever subjected to uniformly varying load (UVL-maximum at fixed end and zero at free end) using double integration method. [8].
 - b) A cantilever of length 2 m carries a point load of 20 kN at the free end and another load of 20 kN at its centre. If E = 10'N/mm² and E=10^k mm⁴ for the cantilever then determine by moment area method, the slope and deflection of the cantilever at the free end. [8]

OR:

1.1

S - 2077

- State the importance of theories of failure and explain the maximum distortion energy theory (von Mises - Henky Theory) [8]
- (Q6) a) Explain the concept of equivalent length of the column and derive the expression for crippling stress in terms of effective length and radius of gyration.
 - b) Find the deflection at the free end of a cantilever of length I carrying a uniformly distributed load of w per unit run over the whole span using energy theorem. Assume uniform flexural rigidity. [8]

0

S - 2078

Total No. of Pages : 4

Total Marks : 199

[8]

Seat No.

> S.E.(Mech.) (Part - II) (Revised) Examination, December - 2015 Fluid and Turbo Machinary Sub, Code : 63362

Day and Date : Wednesday,02 - 12 - 2015 Time : 10,00 a.m. to 01.00 p.m.

Instructions:

- 1) All questions are compalatry
- 2) Figures to right indicate full marks.
- 3) Assume suitable data if necessary and indicate clearly.
- 4) Use of non-programmable calculator is allowed,

Q1) a) Show that the maximum efficiency (hydraniic) of Pelton wheel given

by
$$u_n = \frac{1 + \cos \phi}{2}$$
 Where ϕ is backet outlet angle. [8]

 b) The following data relate to a Palion wheel Head =72m Speed of wheel =240epen Shaft power of wheel =115 kW Speed ratio=0.45 Coefficient of velocity=0.98 Overall efficiency =855%

Design the Polton wheel

OR.

- c) A turbine works order a head of 200m and it develops 6000kW power at 200mm. The overall efficiency of turbine is 87% find its unit quantities. A model is to built which is similar to above turbine in all respect having the scale ratio1:10. It is tested under a head of 20m. Find the speed, discharge, power and specific speed of model having the same overall efficiency as turbine. [8]
- (22) a) Explain governing of Francis turbing with near sketch.
 - b) Determine the overall efficiency of Kaplan turbine developing 2850 kW under a bead of 5,2m, it is provided with a draft tube with its inlet diameter 3m and set 1.8m above the tail race level. A vacuum gauge connect to the draft tube indicates a reading of 5.2m of water. Assume deaft tube efficiency or 75%. [8]

ET.O.

1915

F103

- The following data is given for Francis turbine; net head 60m, speed 700 rpm, shall power 294.3KW, overall efficiency 84%, hydraulic efficiency 93%, flow ratio 0.2, breadth ratio 0.1: Outer diameter of runner is two times the inner diameter. The thickness of runner occupy 5% of circumforential area of runner, volocity of flow is constant at inlet and outlet and discharge is radial at outlet. Find [8]
 - Guide binde angel

431

- ii) Diameter of runner at inlet and outlet
- iii) Rutter vate angles
- iv) Width of wheel it outlet
- (Q3) a) Obtain uppression for minimum starting speed of pump. [8]
 - b) Write short notes (any two)
 - () Types of impellen used in centrifugal pomp-
 - ii) Efficiencies of centrilegal pump-
 - iii) Importance of multi-staging of pump-

OR-

- a) () A centrillogal pump is to discharge 0.138 m²/s at a speed of 1450 rpm against a besil of 25m. The impeller discourse is 250 mm, its width at outlet in 50mm and monomerie officiency is 75%. Determine the your periphery of the impeller. [5]
 - Two geometrically similar parage are maining at the same speeds of 1000 rpm.One pump has an impeller diameter of 300 use and lifts water at the rate of 0.02 m?/sec against n hand of 15m. Determine the based and impeller diameter of the other pump to deliver half the discharge. [5]
- Q4) a) Derive the expression for the workdone by single stage reciprocating compressor during [8]
 - Isothermal compression
 - Polytropic compression.
 - iii) Adiabatic compression

Discuss about which is the most efficient compression process for reciprocating compressor.

Write Short notes on any two

-[19]

- B Construction and Working of root blower.
- B) Derive expression for workdom by reciprocating compressor with elemence volume
- Multistage reciprocating air compressor.

(2e)

151

583

Solve following two problems

Following data related to performance test of single acting reciprocating compressor

- a) Soction pressure = 1 bag
- b) Suction tangersture = 20°C.

c) Discharge pressure = 6 bar

- d) Discharge temperature = 180 °C
- speed of compressor = 1200 rpm
- B Mass of air delivered = 1.7 kg/min

Calculate indicated power of compressor. Take R= 287 J/kgK

- 6) A single stage double acting air compressor is required to deliver 14 m² of air per minute measured at 1.013 bar and 15°C. The delivery pressure is 7 bar and the speed 300 rpm. Take the elemence volume as 3% of the swept volume with the compression and expansion index of n= 1.3, calculate Swept volume of cylimber [5]
- Q5) 30 Define degree of reaction for the axial flow compressor. Discuss efficus of following cases [8]
 - 50% degree of reaction.
 - ii) Low degree of reaction
 - b) A centrifugal compressor with 75% is entrople effleiency delivers 25 kg of air per minute at a pressure of 4 bar. If the compressor receives air at 20°C and at pressure of 1 bar. Find
 - Actual temperature of the air in exit.
 - D Power required to number compresses if mechanical officiency in 95%

Take y= 1.4 and Cp=1 kJ/KgK

OR.

- c) An axial flow compressor with compression ratio as 4, draws air at 20 °C delivers it at 197 °C and rotates with blade velocity 180 m/s. Assoning 50% degree of reaction. The mean blade speed and velocity are the constant throughout the compressor. Determine
 - Velocity of flow
 - ii) Number of stages.

Take work factor is 6.82, $g = 12^{\circ}$, $\beta = 42^{\circ}$, Cp 1.005 kJ0.gK. [8]

-3-

S = 2078

- Q6) a) Explain with next sketch simple open cycle gas turbine along with P-V diagram. State advantages of open cycle gas turbine [8]
 - b) A gas turbine unit has a pressure ratio of 6:1 and maximum cycle temperature of 610°C. The isontropic efficiencies of the compressor and turbine are 0.80 and 0.82 respectively. Calculate the net power output in kW from turbine when the air enters the compressor at 15°C at the rate of 16 kg/s. Take Cp= 1.005 kJ/kgK and y= 1.4 for the compression process and take Cp =1.11 kJ/kgK and y= 1.333 for the expansion process. [8]

OR.

- c) The air enters the compressor of an open cycle gas turbine at pressure of 1 har and temperature of 20°C. The pressure of the air after compression is 4 bar. The isontropic efficiency of compresser and turbine are 80 % and 85 % respectively. The air fuel unio used is 90: 1. If the flow rate of air is 3 kg/s, find
 - i) The compressor power and turbine power
 - ii) Net Power developed

Take Cp= 1.0 kj kgK and y =1.4 of air and gas. Calorific value of fuel = 41800k3/kg. [8]

S-2079 Total No. of Pages : 3

Total Marks (100)

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S.E. (Mechanical) (Part - II) (Revised) (Semester - IV) Examination, December - 2015 THEORY OF MACHINES - 1 Sub. Code : 63363

Day and Date : Thursday, 63 - 12 - 2015 Time : 9.40 a.m. to 01.80 p.m.

Instructions : 1) Attempt all questions.

- Figures to the right indicate fell marks to the question.
- Draw unit labeled sketch wherever necessary;
- 4) Assume suitable data, if necessary and state clearly.
- 5) Use of non-programmable calculator is allowed,

(21) a) Write a note on different types of kinematic pairs.

[8]

OR

- a) Explain the inversions of four-bar chain with neat sketches.
 [8]
- b) Locate all the instantineous centers of the slider crank mechanism shown in fig.1.c. The lengths of crank OA and connecting rod AB are 90 min and 360 mm respectively. If the crank rotates in clockwise direction with a speed of 150 r.p.m., find : [8]

i) velocity of slider B and

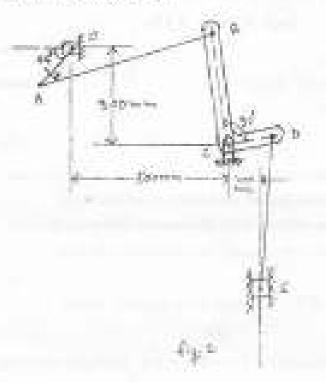
ii) Angular velocity of the connecting rod AB,

figitio

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Q2) The crank of a mechanism shown in fig.2 rotates in anticlockwise direction at a speed of 100 r.p.m. The dimensions of the verious links are : OA = 150 mm, AB = 600 mm, DE = 500 mm. Link BCD is a bell-crank lever with angle BCD = 90°, BC = 350 mm, CD = 150 mm. Determine the velocity and acceleration of the slider at E. [18]



((3) a) Derive the equation for friction torque in cuse of conical pivot bearing assuming uniform wear with usual netations. [8]

OR.

- a) Derive the equation for friction torque in case of flat collar givest beining assuming uniform wear with usual notations. [8]
- b) A transmeted conical pivot with angle of cone as 100° supports a haid of 18kN. The external radius is 2.5 times the internal radius. The shaft ratines at 150 r.p.m. If the intensity of pressure is to be 300 kN/mm³ and coefficient of friction is 0.05, determine the power lost in working against friction assuming uniform pressure. [8]

Q40 a) Draw unit sketches of different types of cums. [4]

b) The following data relate to cam profile in which the follower moves with uniform acceleration and deceleration during ascent and descent.

661

167

Minimum radius of cam = 25 mm

Roller Diameter = 8 mm

Lift of follower = 30 mm

Offset of follower axis = 12 mm towards right

Angle of ascent = 60°

Angle of descent 90°

Angle of dwell between ascent and descent = 45°

Spend of cam = 200 rpm

Draw the profile of the cast and determine the maximum velecity and dur million acceleration of the follower during the outsuble. [14]

Q5) a) An open belt of rectangular cross section of 100 mm × 10 mm connects two pulleys 1250 mm and 500 mm diameter, on parallel shafts 5 m apart. The mass of belt per meter length is 1 kg/m. Maximum tension is not to exceed 2000 N and metflicient of friction is 0.3. The bigger pulley is the driver and runs at 250 rpm and driven shaft runs at 600 rpm. Calculate the power transmitted and torque exerted on each shaft considering centifical tension. [10]

Derive an equation for centrifugal traslop in helt. bi

OR-

b) With next sketches explain different types of belt drives.

- (26) a) The lengths of the upper and lower arms of a Poner governor are 200 mm and 250 mm respectively. Both the arms are pivoted at the avia of rotation. The control sizeve load is 150 N, the weight of each ball is 20 N and the friction of the sleeve is equivalent to 30 N. If the limiting inclinations of the upper arms to the vertical are 30° and 40°, determine the mage of speed of the governot. (10)
 - By means of controlling force curves explain stable governer, smalle governor and Isochronous governor. [6]

OR.

Define sensitiveness, builting and Isochronism of governor. [6]

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S = 2080

Total No. of Pages : 2

Seat No.

S.E.(Mechanical) (Revised) (Part - II) (Semester - IV) Examination, December - 2015

Machine Tools and Processes

Sub. Code : 63364

Day and Date : Friday,04 - 12 - 2015 Time : 10.00 a.m. to 01.00 p.m. Total Marias : 100

lastructions) 1) All questions are compulsory.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable data, if necessary.
- 4) Use of Non-programmable Scientific Calculator is allowed.

QD: a) State the function different elements of gating system with near electric [8]

b) Explain in brief construction & working of cold chamber die casting process. [8]

OR

- b) What is meant by continuous casting? Explain its merits, demerits and applications.
 [8]
- Q2) a) Explain construction and working of hydraulic extrasion. Also write defects in extrusion. [8]
 - (b) Draw block diagram of inthe and explain to brief principal parts of inthe [8]

OR

b) Describe the method of injection moulding for high production rates?[8]

(23) Write a short rate on (Any Three).

- a) Centrifignal custing,
- b) Induction Families
- a) Defects in Rolling
- d) Calendarieg and thermu forming

RTO

[18]

S - 2080

 0.07 ± 3 Coloulate the gear train for cutting the 12 TPI pitch on work piece if the lead screw of little is 4 TPL 131 The latite is supplied with a change gear sot from 20 to 120 teeth in steps of 5 teeth and an additional gen of 127 teeth. A loths is provided with a charge gear set from 20 to 120 tooth in steps 357 of 5 teeth and an additional gear of 127 teeth. Find the geer train for cotting metric thread of 4.25 mm pitch on a lathe having lead acres witch as 6 TPL [5] 69. Enumerate various transit tool holding device with near sketch. 188 OR: Describe construction, working & operations of vertical boring machine 63. with most sketch. 181 Explain with next sketch vertical milling attachment for Horizontal milling 050 m machine. 181 How are the shapers classified? State the purpose of the following parts. 61. HLR shaper [8] 8. Colemn. 63 Cross-mill 涵 Table. WFShaper local OR. b) List various gear manufactoring processes. Explain gear hobbing process

Q6) Write a shurt ooir on (Any Three)

with next sketch.

- 81 Gate Shaving.
- Electric discharge machining. 61.
- -123 Jig Boring muching
- d) Loser beam machining



1181

181

S-2437 Total No. of Pages : 4

Seet No.

S.E. (Mechanical Engineering) (Semester - IV) Examination, November - 2015 APPLIED NUMERICAL METHODS Sub. Code : 63360

Day and Date : Monday, 30-11-2015. Time : 10.00 a.m. to 01.00 p.m. Total Marka: 100

Instructions: 1) All questions are compulsory.

- 2) Make suitable assumptions/ data if required and state clearly.
- 3) Draw near shretches wherever necessary,
- 4) Figures to the right indicate full marks,
- 5) Use of calculator is allowed.

Q(1) a) Explain accuracy and precision with the help of a next sketch. [5]

by Solve any more

 $|2 \times 5 = 10|$

- Find the root of the equation x¹ 4x 9 = 0 using false position method up to two decimal places.
- Using Newton Rapisson method, find the tent root of 3x ens x +1 = 0.
- iii) Use Muller's method to find a root of the equation xⁿ 3x 7 = 0, where the root lies between 2 and 3.

Q2) a) Solve the following equations by Gauss-Jardon method.

151

2v = 6y = z = 7v = 2v - z = -1

5z = 7y = 4z = 9

P,T,O

b) Solve my two:

Solve the system of equations using LU Decomposition.

$$2x - 3y + z = 9$$

 $x + 2y + 3z = 6$
 $3x + y + 2z = 8$

ii) Solve by Gauss Elimination method

3x + 4y + 5z = 18 2x - y + 8z = 135x - 2y + 7z = 20

iii) Solve the following equations by Gauss-Seidal method.

8x + 2y - 2z = 8x - 8y + 3z = -42x - y = 9z + 12

Q3) a) Find f(x) as a polynomial in x and hence f(6) for the following data by Newton's divided difference formula. [5]

> x = 1 = 2 = 7 = 8f(x) = 1 = 5 = 5 = 4

b) Solve any two:

 $|2 \times 5 = 10|$

 The following table gives experimental data for firce (N) and velocity (m/s) for an object suspended in a wind tannel.

Vefocity (m/s)	10	20	30	40	50	- 60	70	80
Force (N)	24	68	378	552	608	1218	831	1452

Use the linear least-squares regression to determine the coefficients a and b in the function y = a + bx that best fits the data.

12.5

S-2437

B) Fit a normal curve to the following data:

Length of line mi = 8.60 - 8.59 - 8.58 - 8.57 - 8.56 - 8.55 - 8.54 - 8.53 - 8.52 Frequency = -2 - 3 - 4 - 9 - 10 - 8 - 4 - 1 - 1 ii) Use Lagrange's formula to find y(10), Given

x		6	9	11	
y i	- 12	13	14	-16	

Q4) Solve my three:

- $[3 \times 5 = 15]$
- a) Evaluate the integral $1 = \int_{0}^{1} \frac{1}{(1+x)dx}$ using Simpsons 3/8th Rule. Take u = 6.

b) Evolute fil/(x'+10sfx by Gaussian Quadrature

- c) Use Romberg's method to evaluate $\int_{0}^{t} (dx/(1+x)) take h = 0.5, 0.25$ and 0.125
- (d) A rod is rotating in a plane. The following table gives the angle θ (in radians) through which the rod has turned for various values of time 't' (seconds). Calculate the angular velocity of the rod at t = 0.6 second

1 0	0.2	0.4	0.0	0.8	1.0
0 0	0.12	0.49	1.12	2.02	3.20

Q5) Solve any three:

 $[3 \times 5 = 15]$

(a) Given $\frac{dy}{dx} = \frac{y-x}{y+x}$

with y(0) = 1. Find y(0, 1) using modified Euler's method.

- Dsing Euler's method, find an approximate value of y when x = 1, in five steps gives that:
 - $\frac{dy}{dx} = x + y$ $\mu(0) = 1$

-3e

151

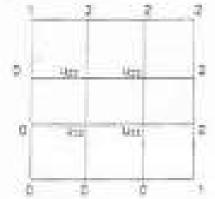
151

c) Solve the equation $\frac{dy}{dx} = x + y + y$

Given y(0) - 1. Obtain the values of y(0,1) using Picard's method.

- d) Find the largest Eigen value and the corresponding Eigen vectors of
 - $\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

Q6) a) Solve U_m + U_m = 0 in the square region with boundary values as shown in figure. (10)



Perform two iterations:

b) Classify the following partial differential equations

i) Φ_+Φ_=0

(i) $xU_m + yU_m = 4y^2U_s = 0$

- c) Use explicit method to solve for the temperature distribution of a long thin rod with a length of 10 cm and following values Δx = 2cm, Δx=0.1 second, and A = 0.0203 at time t = 0.1 second, 0.2 second at t = 0 the temperature of rod is zero and the boundary condition are fixed for all times at T(0) = 100°C and T(10) = 50°C. [5]
 - d) Explain Crank Nicholson method.



úlia

S - 2504 (A) Total No. of Papes : 3.

S.E. (Mech.) (Part + II) (Pre-Revised) Examination, December - 2015 FLUID AND TURBOMACHINERY

Sub. Code : 43597

Day and Date : Saturday, 95 - 12 - 2015

Total Marks : 180

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

Instructions : 25 Attempt any three quartiess from each section.

- Figures to the right indicate fall marks. 287
- Assume suitable data if necessary, 31°
- 4日 Use of nonregenannable calculator is allowed.
- Drow near sketch wherever necessary, 51°

SECTION - I

- What are unit quantities? Define the unit quantities for a turbine. Why are QU = 0they important? BRE.
 - A Polton wheel 2.5 m diameter operates under the following conditions:[8] bS_{-} Net available head = 300 m. Speed = 300 rpm Blade nogle at outlet = 165%

Blade friction coefficient = 0.95 Mechanical efficiency = 95 %

C. of the ist = 0.98

Jet diameter = 20 cm.

Determinet Power developed $\overline{\mathbf{D}}$

Specific speed 65

Hydraulic efficiency. 80.

- Draw a schematic diagram of Kaplan turbine and explain function of (22) (a). each part of Kaplan turbine. 171
 - An inward flow reaction turbine develops 1200 kW power having the bWvane velocity at inlet as 30 m/s and the corresponding whirl velocity of 24 m/s. The ratio of outer to inner diameter is 2. The velocity of flow remains at 6 m/s throughout and discharge at exit is radial. The headavailable on wheel is 75 m. Find: <u>191</u>
 - Vare angles. 86
 - ii) Power developed
 - iii) Discharge in m3/s

iv) Hydraulie efficiency

BTO:

Scot. $N_{\rm He}$

S-2504 (A)

- Q3) a) Explain the working of single stage contrifugal pump with sketch. [4]
 - Define navitation. Give nonessary pregautions to mood the cuvination.[4]
 - c) A contribugal pump delivers 1.27 m³ of water per minute at 1200 pm. The impeller diameter is 350 mm and broadily at outlet is 12.7 mm. The pressure difference between inlet and maler of pamp casing is 272 kN/m³. Asseming panometric effectioncy as 63%, calculate the impeller can blade angle [8]

Q4) Write short notes on any three.

[18]

- a) Pelton wheel buckets.
- b) MPSH & NPSH
- e) Priming of Pumps.
- d) Various efficiencies of turbing,
- Multi staging of pomps.

SECTION - II

- Q5(a) Derive the expression for minimum work required for two steps reciprocating compressor with inter coder. [8]
 - b) A single stoge single acting to oppositing air compressor delivers 0.6 kg/min of air at 6 bar. The temperature and pressure at the storion struke are 30°C and 1 bar respectively. The bare and stroke are 100 mm and 150mm respectively. The clearance volume is 3% of the swept volume and index of expansion and compression is 1.3. [8]

Determine,

- i) the volumetric officiency of compressor.
- ii) the power required, if mechanical efficiency is \$5%.

(26) a) Explain the losses and isentropic efficiency in centrifugil compressor.[8]

-3-

b) An axial flow compressor baying 10 stages works with 50% degree of reaction. It compresses air with a pressure ratio of 5. The interconditions of air are 27°C and 100 kPs. The air enters the compressor with a velocity of 110 m/s. The mean speed of the rutur blade is 220 m/s. The isontropic efficiency of the compressor is 85%. Calculate the work input per kg of air and blade origins. [8]

S-2504 (A)

- Q77 a) Draw the schematic diagram of closed cycle gas turbine power plant. State merits and denicrits. [8]
 - b) Air enters the compressor of a gas turbine plant operating on air standard cycle at 100 kPa and 300K with a volumetric flow rate of 5 mVs. The compressor pressure ratio is 10. The turbine inlict temperature is 1400K. The turbine and compressor each has an isomropic efficiency of 80%.[8] Calculate,
 - The durmal efficiency of the cycle
 - ii) The back work ratio
 - all The net power developed in kW.

(28) Write show notes on any fires.

- al Boots blower and Vane blower.
- b) Applications of compressed air.
- v) Slip factor and prewhist.
- d) Classification of compressor.
- 13 Degree of reaction.

[18]

-3-

8 - 2554

Total No. of Pages : 2

Sert			
Ne.:	_	_	

S.E. (Mechanical) (Pre-revised) (Part - II) (Semester - IV) Examination, December - 2015 MACHINE TOOLS

Sub. Code: 43595

Day and Date : Thursday, 03 - 12 - 2015

Total Marks : 100

PTO

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

Instructions: 1) Altempt any three question from each section.

- 2) Figures to the right indicate full marks.
- 3) Assume suitable dam, if necessary.
- 4) Use of non-programmable Scientific enterlance is allowed.

SECTION - I

01)	a)	Draw block diagram of lathe. Name different pure of lathe and sta- function of each.	te the [8]
	b)	Explain various accessories used on lathe.	[8]
(22)	a)	Compare turret lathe and capstan lathe.	[8]
	69	Explain with near sketch bar feeding mechanism in capstan lathe.	[8]
23)	at	Describe with east sketch, construction and working of vertical b machine.	oring [8]
	69	State classification of drilling machine and explain various open performed by drilling machine.	itions [8]
24)	Wr	ite a short note on (Any Three)	[18]
	10	Turret indexing Mechaniam	
	19	Crank and slotted link quick return mechanism in shape:	
	4)	Classification of planning machine	
		같은 것	

d) Jig Boring Machine

S - 2554

SECTION + II

Q5) 1	Explain with neat sketch working of column and knee type reachine,	e milling [8]
4	Describe with near sketch vertical milling attachment for himiling,	orizontal [8]
Q6) 1	How are grinding machine classified? Explain any one with next a	ikeich.[8]
4	State specifications of grinding wheel and explain its meaning,	[8]
27 a	List various gear manufacturing processes. Explain gear hobbin, in detail.	g process [8]
涛	Explain Construction and working of CNC Machine with Diagram.	h Block [8]
Q8) V	te a short nute on (Any Three)	[18]
	Wheel truing and Wheel loading of Grinding Wheel	

b) Up milling and Down milling

c) Gear finishing processes

d) Types of CNC machines

000

-1-

SC-53 Total No. of Pages ; 3

Total Muris : 100

S.E. (Mech.) (Semester - IV) Examination, November - 2019 APPLIED NUMERICAL METHODS

Sub. Code : 63360

Day and Date : Wednesday, 13 - 11 - 2019 Time : 2.30 p.m. to 5.30 p.m.

- All questions are compulsory. 35
 - Use of non-programmable calculator is allowed. 25
 - Assume additional data if required and mention it clearly. 20.5

OI) Solve any two:

Destructions:

Sept

No.

a) Perform two iterations of Newton Raphson Method to Solve:

 $x^{2} + xy + y^{2} = 7, x^{3} + y^{2} = 9$

Take initial approximations $X_a = 1.5$, $Y_a = 0.5$.

- Define errors? Explain Approximation error with an example: bb
- Find root of equation $x^3 4x 9 = 0$ using bisection method, correct to 63 F three decimal places.

Q2) Solve any two:

Solve following equations by Gauss Seidal method. 20.

2x + y + 6z = 9, 8x + 3y + 2z = 13, x + 5y + z = 7,

Solve following equations using LU-decomposition method 16

10x + y + 2y = 13, 3x + 10y + z = 14, 2x + 3y + 10z = 15.

Solve by Jacobi Iteration Method 61.

Litt-B5524A 8x - 3y = 2x = 20, 6x + 3y + 12x = 35, 4x + 11 - x = 33

ETO

1161

1161

Q3) Solve any three:

- What are the applications of binomial distribution and normal distribution. 郤
- Find Mean and Median b5.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	12	18	27	20	10	6

 $\{0\}$ Find missing term in the following table using Lagrange's interpolation femula.

х	0	4	2	3	<u>_4</u>
Y	1	3	28	-31	- 81

Find f(x) as a polynomial in x and f(6) for the following data by Newton's dbdivided difference formula

Н.	1	2	7	8
,f(x)	1	5	5	4

Q4) Solve any three:

a) Evaluate the integral I = [sin x dx using Trapezoidal and Simpsons 1/32 Rollar

Take n = 10.

- Use Romberg's method to evaluate $\int_0^1 \frac{x}{\sin x} dt$ take h = 0.5, 0.25, and b it. 0.125.
- Evaluate $\int_{0}^{\pi/2} (\sin x) dx$ by two point Gaussian Quadrature formula. \mathcal{C}
- Find the value of cos(1.74) from the following table d5

X 2	1.7	1.74	1.78	1.82	1.86
Sin(x)	0.9916	0.9857	0.9781	0.9691	0.9584

SC-53 1181

3×6=181

O5) Solve any three

a) Solve

dyS gives y(0) = 1. Obtain the values of y(0,1) using Picard's $m_{\rm eff}^2$ dtmethod

Apply the fourth order Runge Kutta method to find y(0.2) given bi-

$$\frac{dy}{dx} = y + x; \ y(0) = 1 \text{ take } h = 0.1$$

Find v(0.2) and v(0.1) by Euler's Method, 63.

$$|t'| \frac{dy}{dz} = x^2 + y^2; \ y(0) = 1.$$

- Find the largest Eigen value and the corresponding Eigen vectors by $d3^{\circ}$ power method. K-85744

Solve $y_{-} = 0$ in the square region bounded by x = 0, x = 4, y = 0. O6) al 1 y = 4 and with boundary conditions: 1101

u(0, y) = 0

((4, y) = 12 + y)

n(x, 0) = 3x

 $\mu(x, A) = x^2$

SUKESSA

take $\Delta x = 1$, $\Delta y = 1$. Perform two iterations

b) Classify the following partial differential equations $U_{cr} = 8U_r + U_{rr} [4]$ SUK-BSRA

SC - 56 Tuil NeutPaper 3

S.E. (Mechanical) (Semester - IV)
Examination, November - 2019
ANALYSIS OF MECHANICAL ELEMENTS
Sub. Code : 63361

Day and Date (Thursday, 14 - 11 - 2019) Time : 2.30 p.m. to 5.50 p.m.

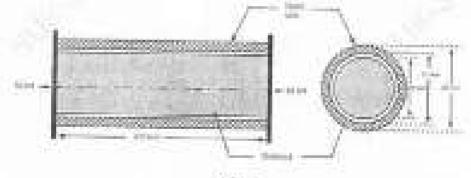
Total Marks (100

Instructions):

Notett

No.

- Alt providents are compulsory.
- 25 Accume suitable data wherever necessary and state it effectly:
- 2) Figures to the right indicate full starks.
- 4) Draw and and labeled donatos where er necessary
- 5) Use of non-programmable infeatutor is allowed
- Q13 a) A steel bar 20 jum in diameter is enclosed in a brass tube of 25 mm external diameter and 2 mm that. Assuming EncEh = 2 and initial length of both the components is 460 mm, inleadore stresses in soul and brass of the composite section which is subjected to on axial componentive force of 50 KN. Assume Es = 300 GPa. Find also change in bright of composite section. [12]





 Draw stress-strict diagram of ductile and fultile material subjected to usual leading and explain the important points of diagram [6]

OR:

A bollow steel shaft into transmit 300 KW power at 80 rpm. If the show stress is not as exceed 60 'Warm³ and internal diameter is 0.6 of the ordered diameter. First example and internal diameters, assuming that maximum torque is 1.4 times the mean tangue. [6]

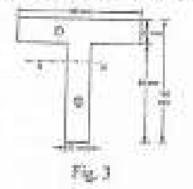
ETO.

SC-56

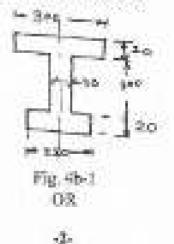
Q2) Draw SFD and BMD for loading condition shows in fig 2. Locate point of inflection if any and Maximum bending moment. [16]



Q3) A cast iron beam is of 'T section as shown fig. 3. The beam is simply supported on a span of 8 m the beam carries UER of 1.5 KN/m on the entire span. Detennine maximum tensile and maximum compressive strength. [16]



- Q40 a) Derive the expression for the normal spesses and tangential stress when member subjected to like circet stresses in manally perpendicular directions. Show the locations of principal planes and planes of maximum shoar.
 - b) The dimensions of an 1 beam shown in figure are: Top flange 300 mm × 20 mm, Bottom flange 220 mm × 20 mm and web 20 mm × 300 mm. Sketch the short stress distribution across the section showing all values if it has to renist a shear force of 200 kN. [9]



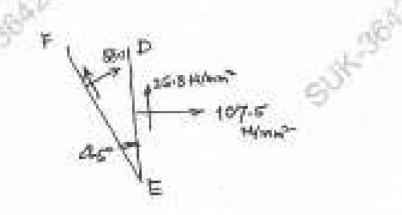
SUKASSIL



Figure shows normal and tangential stresses in two planes. Determine the principal invest-

SC-56

181





- Derive the equation of slope and dedication of a simply supported beam OSFAL: of length L carring point load at the center. Use double integration method. (B):
 - b) A cantilever hears of span 3 m is carrying a point load of 20 kN in the free end and 50 kN at 1 m from the free end. Find the slope and deficition of cartillever at the free end. Take EI-3000 kN/m2

OR

State the importance of theories of failure and explain the maximum principal stress theory. 181

- A straight both ends hinged column is 50 mm in cliqueter and 1250 lung, 061.61 Colesiane:
 - Euler's origoling lead when loaded axislity and В.
 - The eccentricity which will cause failure at 75% at of this load if the 10 i yield point stress of the material is 275 Minur², TakeE =2+80 Niture²,
 - Find the deflection at the center of a simply supported beam of span "?" bbcarrying a UEM, of 'w' per utilt run over the whole span, using energy SUK-BBAR theorem. Assume uniform flexual rigidity, <u>88</u>

34

SC - 59 Total No. of Pages : 4

Neat No.

S.E. (Mechanical Engineering) (Part - II) (Semester - IV) (Revised) Examination, November - 2019

FLUID AND TURBO MACHINERY

Sub, Code : 63362

Duy and Dute : Friday, 15 + 11 + 2019 Time : 2.20 p.m. to 5.30 p.m.

Total Market 190

181

BTO

lastractions: 1) All questions are computatory.

- 2) Equivor in the eight side indicate full marks.
- 30 Assume subsible data if necessary and indicate clearity.

Energian programmable valuelator is allowed.

Q1) a) Explain governing of percontentions with most skepters.

- b) A petien wheel has a mean bucket speed of 12 m/s and is supplied water it a rate of 750 litras per second under a head of 35m. If the bucket deflects the jet through angle of 160°, find the power developed by the mebine and its hydraulic efficiency. Take the coefficient of velocity as 0.98. Neglect friction in the backet. Also datermine the overall afficiency of the turbine if the mechanical efficiency is 80%. [8] (38)
- c) A pelton wheel working under a head of 500 motors has an overall efficiency of 85% and rans at 630 pm developing 6590 KW of shaft power. Taking the bucket speed at 0.47 times the jet speed and assuming Cv = 0.97, find (i) the wheel diameter & (ii) jet diameter [8].
- (Q2) a) Explain the autostruction & working of fraccinator bine by drawing a next sketch.
 - b) A reaction turbine works at 450 rpm under a head of 120 meters, his dismeter at inlet in 1,20m and the flow area in 0,4m². The angles made by the absolute & reliative velocities at inlet are 20° & 60° respectively with due targettial velocity. Determine
 - Volume flow rate,
 - (i) Power-developed
 - iii) Hydraulia efficiency

Amune which at confet to be zero.

OR

SC - 59

1011

- Particulars of a reaction torbite are given below: Head on turking 43 - 180mm; Inlet diameter = 4.25m; outlat diameter - 2.75m; Inlet sameangle - 120°; velocity of flow at outlet = 16 m/s; Hydraulio officiency = 9255 within of wheel is same at inlet & outlet. Discharge in outlet is entirely radial. Calculate the speed of the turbine.
- 035.65 Drawness sketch of cerar-Jugal pursp & soglatin different heads associated withit. 181
 - A centrifugal pump discharging 570 liters of water per second has to ЪТ develop a head of 12 meters, the speed of rotation of impeller being 750 rpm. The mandoustric efficiency is 80% and loss of band in the pumpdue to friction is 0.326 V² meters of water where "V," is the velocity with which the water teaves the impeller. Assume that the velocity of flow through the impeller is constant at 2.7 meters per second & that there is no velocity of whirl at infer. Determine : 13.69
 - Đ. Diameter of the impeller:
 - 67 Outlet mea.
 - Vine angle at the outlin edge of the impeller. iib.

OR.

- c) A contributed pump having an overall efficiency of 75% delivers 1820 litzes of water per minute to a height of 18 metres strough a pipe of 100 run diameter and 90 meters length, Taking / -0.012, find power requiral to drive the nume. £1.07
- Explain the working of two stage reciprocating compressor with help of O41 a) P-V diagram and derive equation for work done by compressor. 3.63
 - Write short note on any two 65.
 - b Different efficiencies of recipiocating compressor.
 - ii) Winfedore during the Polycopic compression (PV^{*} = contant) in single stage reciprocating compression, 1849
 - iii) Working and Construction of root blower.

CORE

120

c) Solve following two questions

1101

- B Single stage single arting reciprocating air compressor has a bore of 200 mm and stroke of 300 mm. It recovers air at 1 bar and 20°C and delivers it at 5.5 bars. If the compression follows the law PV¹³ = constant and clearance volume is 5 % of streke volume, determine the power required to drive the compressor if it mess at 500 rpm.
- E) A compressor draws 42.5 m³ of sir per minute into the cylinder at a pressure of 1.65 bar. It is compressed polytropically (PV¹³ = constant) to a pressure of 4.2 bar before being delivered to receiver. Assuming a mechanical efficiency of 80% find
 - 1) Indicated power
 - 2) Shaft power
 - (i) Overall isothermal efficiency
- Q5) a) Explain Sollowing terms used in working of axial flow compressor, [8]
 - B Surging
 - 6 Cheking:
 - ii) Stating
 - Define degree of reaction of axial flow compressor and comments on following case of degree of reaction [8]
 - Low degree of reaction stage.
 - (i) 50% degree of resistion stoge
 - iii) High degree of reaction stage

OR:

() A rotary air compressor receives air at pressure of 1 bir and 11°C and delivers is at a pressure of 6 bir. Determine per kg of air delivered, work done by the compressor and bear exchanged with the jacket water when the compression is isothermal, isothermal by the relation PV¹⁴ = Constant. [8]

- Q6) a) Give different methods to improve the efficiency and specific output of simple gas terbine cycle. Explain any one with next sketch. [8]
 - Following particular minute to closed cycle gas tarbine using arms working medium.

Atmospheric temperature = 26°C

Maximum temperature = 870°C

Initial pressure in compressor + 1bar

Final pressure of compressor = 5 fear-

Turbing efficiency = 0.84

Compressor efficiency = 0.8

Calorific value of fiel = 41840 KJ/kg

Cp=1.005%J/Kg/K

YE LA

Determine the compressor work, furthine wirk, net work done and thermal efficiency of gas turbine. [8]

0Ŕ.

c) A simple gas turbine takes air in at atmospheric private at 15°C and compresses the air in the compressor up to 6 bir. Then air enters the combisation disorder and is beaud to maximum temperature of 750°C. Then it enters the arbitra and expands to atmospheric prostore if is encopic efficiency of compressor and taching in 0.8. Cp for both air and gases 1.005 kMagK, y=1.4. Determine maps flow rate of air and gases through parbine to develop and power of 1100 kW. [8]

15-25P

SC-62 Total No. of Pages : 4

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Mag	
1999	

S.E. (Mechanical) (Part-II) (Semester - IV)

Examination, November - 2019

THEORY OF MACHINES-I

Sub. Code : 63363

Day and Date : Tursday, 19-11 - 2019

Total Marks: 109

Time : 2.30 p.m to 5.30 p.m.

- Instructions: () All questions are compulsory.
 - 2) Figures to the eight indicate fall murks.
 - 5) Draw neut labeled sketches wherever measury,
 - 4) Assume if necessary suitable data & state clearely.
 - 5) Use of Non-programmable calculator is permissed.
- Q1) a) What is inversion of mechanism? Explain inversions of double slider crunk thain with neut sketches. [8]

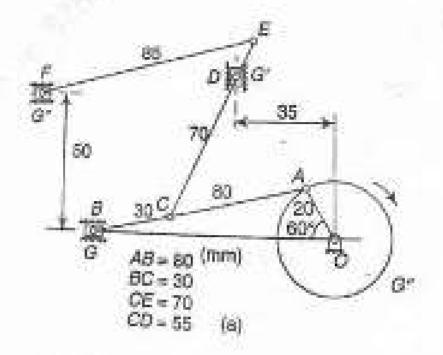
RO.

Explain condition of convert steering. Also differentiate Ackerman steering gear mechanism and Davis Steering gear mechanism. [8]

- b) In a slider crank mechanism, the lengths of the crank end connecting rod are 200 mm and 800 mm respectively. Locate all 1-centers of the mechanism for the position of the crank when it has turned 30° from the inner dead center. Also find the velocity of the alider and the angular velocity of the connecting rod if the crank rotates at 40 rad/s. [8]
- Q2) In the mechanism above in following figure, the crank OA rotates at 210 cpm clockwise. For the given configuration, determine the velocities and necelerations of sliders B,D and F. The various link lengths are,

SC-62

AB=80 mm, BC=30 mm, CD=55 mm and CE= 70 mm, OA= 20 mm, EF=85 mm.



Q3) a) Derive the equation for force required to lift the load in square threaded screw jack using inclined plane theory. [8]

DR.

- a) Derive the equation for torque required to overcome the friction in collar pivot bearing using uniform wear theory.
 [8]
- b) A 150 mm diameter valve, against which a steam pressure of 7 MN/m2 is acting, is closed by means of a square threaded screw 50 mm in external diameter with5 num pltch. If the coefficient of triation is 0.12, find sceque required to turn the handle. [8]
- (Q4) a) Draw the displacement, velocity and acceleration diagrams for a follower when it moves with shaple harmonic motion and uniform acceleration and retardation. [6]

- b) Draw a cam profile to drive an oscillating roller follower to the specifications given below: Q₀
 - Follower to move outwards through an angular displacement of 20² during the first 120⁶ rotation of the caus;
 - Follower to return to its initial position during next 120° rotation of the care.

(ii) Follower to dwell during the next 120* of cam rotation.

The distance between pivot centre and roller centre=120 mm; distance between pivot centre and cam asits=130 mm; minimum radius of cam =40 mm; radius of roller=10 mm; lowerd and outward strokes take place with simple harmonic motion. [12]

Q5) a) Explain what is dynamometer. What we different types of dynamometers? Explain any one in detail . [6]

OR:

- a) Derive the equation of belt tensions on tight and slack side of belts (T1/T2)-e^{-*}
- b) A belt drive transmits 8 Kw power from shaft rotating at 240 rpm to another shaft rotating at 160 rpm. The diameter of smaller pulley is 600 man and the two shafts are 5m apart. The coefficient of friction is 0.25 if the maximum stress in belt is limited to 3 N/mm² and thickness of belt is 8 run find the width of belt for open belt drive. [10]
- Q6) a) Define and explain the following terins relating to governors: Stability, Sensitiveness, and Isochronism [6]

OR.

 Explain with sketch the working of centrifugal governor. How it differs from fly wheel.

· Shiel

b) In a spring loaded governor of the Hertnell type, the mass of each ball is Ekg, length of vertical arm of the bell crank lever is 100 mm and that of the horizontal arm is 50 mm. The distance of falcours of each bell crank lever is 80 mm from the axis of rotation of the governar, the extreme radii of rotation of the balls are 75 mm and 112.5 mm. The maximum equilibrium speed is 5 per cent greater than the minimum equilibrium speed which is 360 r.p.m. Find, neglecting obliquity of arms, initial compression of the spring and equilibrium speed corresponding to the radius of rotation of 100 mm. [10]

SC - 778 Total No. of Farma : 2

Sest No.

S.E. (Mechanical) (Part - II) (Semester - IV) (Revised) Examination, November - 2019 MACHINE TOOLS & PROCESSES Sub, Code : 63364

Day and Date : Wednesday, 20 - 11 - 2019 Time : 2,39 p.m. to 5,30 p.m. Toral Marks : 100

- Instructions: 1) All questions are compulsory.
 - 2) Figures to the right indicate full marks.
 - 3) Assume saimble data, if necessary.
 - 4) Use of non-programmable scientifice calculator is allowed,

Q1) Attempt any two

- a) Describe in brief different types of sand used to prepare mold in sand casting process. State the desirable properties of molding sand. [8]
- Explain with next sketch centrifugal casting process. State the application of Centrifingal casting. [8]
- State types of induction furnaces used in foundry for melting of CI Explain in brief working of any of induction furnace with next sketch.[8]

Q2) Attempt any two

- a) Define colling process. Explain with next sketch tendem colling mill. [8]
- b) Explain the following with next sketch
 - () Operations performed in forging,
 - ii) Tube drawing process
- Describe with near sketch indisect extrusion process. State the applications of direct & indirect extrusion process. [8]

Q3) Write a short note on Any Three

- Applications and advantages of Injection molding & Blow molding [6].
- b) Thermotorming process
- c) Defects inforging
- d) Casting defects

161

667

661

 $\{81\}$

143

Q4) Attempt any two

- Describe thread cutting exclusion on lathe?
 - If a lathe is provided with a change gear set from 20 to 125 teeth in steps of 5 teeth and an additional gear of 127 teeth. Find the gear train for mating matrix thread of 6.25 mm pitch on a lathe having lead screw pitch as 6 TP1. [4]
- What is the purpose of bar feeding mechanism? Explain with near sketch working of the same.
 [8]
- c) Explain with next sketch construction & working of melial drilling machine.

- [8]

Q5) Attempt any two.

- Nume the different types of milling catters used. State its applications. Also draw near sketch of the milling catters. [8]
- How does srank & slotted link quick raturn mechanism week in shaper? State various operations performed on shaper. [8]
- State gear manufacturing processes. Explain with near sketch gear sheping process.
 [8]

Q6) Write a short note on Any Three

- a) Jig Boring Machine. [6]
 b) Process parameters of Abrasive Jet Machining and its limitations. [6]
 c) Set up of Electro- Chemical machining and its applications. [6]
- d) Process parameters of Ultrasonic machining and its advantages. [6]

-24

SE - 75. Total No. of Piece 14

S.E. (Mechanical Engineering) (Semester - IV) Examination, November - 2018 APPLIED NUMERICAL METHODS

Sub. Code : 63360

Day and Date : Monday, 12 - 11 - 2018

Time : 10.00 a.m. to \$1.80 p.m. Instructions: 11 All constitu-

- D All questions are computany,
- 2) Make suitable assumptions / data if required and state elemity.
- 3) Draw and sketches whenever ministery.
- 45 Flexing to the right indicate full marks.
- 2 Use of calculater is allowed.

Q1/ Solve any two

Sec.

 $N_{\rm He}$

5

ġ

[[2×8=16]

Total Marika : 100

- (b) Use bisection mothed to find the root currect to four decimal places of $f(x) = x^2 10x^2 + 5 = 0$ that lies in the interval (0, 1).
- b) Determine the points of intersection between the circle x² + y² = 3 and the hyperbola xy = 1. Take initial value as x₀ = 0.5, p₀ = 1.5.
- (c) Use Muller's method to find a root of the equation x¹ 7x² + 6x + 5=0, using x₀=0 x₁ = 1 and x₂ = 2 as approximations.

(22) Salve any two

 $[2 \times 8 = 16]$

- a) Solve the following equations by Grant-Jordon method.
 - x + 2y + z = 3
 - 2x + 3y + 3z = 10
 - 3x y + 2z = 13
- b) Solve the system of equations using UU Decomposition.
 - 11-10-52-14
 - 2y + 3y + y = 0
 - $\exists x + y + z = 4$
- (i) Solve the following equations by Genus-Seidel method.
 - $3x-2y+z\approx -4$
 - 8+49-22=+1
 - 3x + y = 5x + 13

P.T.O.

SE - 75 [3 × 6 = 18]

(23) Solve my three

- Find the equation y = f(x) of least degrees and passing through the prime (-1,-283, (1,13), (2,12), (3, 3) by Newton's divided difference formula. Also find y at x = 0.
- The following table gives experimental data for force (N) and velocity (m/s) for an object suspended in a wind tunnel.

Velocity(m/s): 10 30 30 40 30 60 70 80 Force (N1: 24 58 378 552 608 1278 831 1457

Use the linear least-squares regression to determine the coefficients at and b in the function y = a + ba that best Gis the data

c) Fit a normal creve to the following data:

Length of line cm : 8.68 8.59 8.58 8.57 8.56 8.55 8.54 8.53 8.52

Emploney: 2 3 4 9 10 8

d) Use Lagrange's formula to find y(10), Given

xx 5 6 9 11 y; 12 13 14 16

(04) Solve any three.

 $[3 \times 4 = 18]$

 a) Evaluate the integral (= ∫ⁿ_m x00 ds using Simpsons 1/3nd Bule for the following data.

x 20 21 21 23 24 25 26 x 95.9 96.85 97.77 98.68 99.56 100.41 101.24

Byaluzta 1¹¹⁰ (on etar by two point Gaussian Quadrature Strutula.)

d) A rob is rotating in a plane. The following table gives the angle 8 (in radiana) through which the rod has turned for various values of time "(accords). Calculate the angular velocity of the rod at twill becord.

t	0	0.2	0.4	0.5	0.8	1.0
a	0	0.12	0.49	1.12	2.02	3.20

(25) Solve any three

银×6-14

an Given

with y(0) = 1. Find y(0,1) using modified Euler's method

b) Using Euler's method, find or approximate value of y when s = 1, in first steps given that

$$\frac{dy}{dx} = x + y$$
$$y(0) = 1.$$

c) Solvethe equation

l

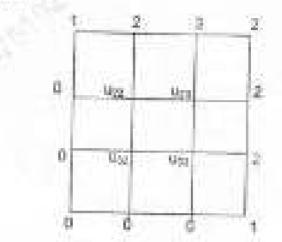
Given 3(0)-1. Obtain the values of 9(0.1) using Ploard's method.

d) Find the largest Figure value and the corresponding Eigen vectors of

0.1	
1 m m	
0.7	201
C .	

SE = 7

Q40 a) Solva U₁₀ + U₁₀ = 0 in the square region with boundary values as show in figure.



Perform investigations.

Solve any use out of b) and v)

11.1.6 = 6

askar.

10 Clearly the following partial differential equations

$$= -4y^2 U_1 + 4y^2 U_2 = 0$$

c) Use explicit mathed to noive for the temperature distribution of a long thin and with a length of 10 cm and following values Ax =2 are, Az =0.1 second, and 1, = 0.021 at time 1=0.1 second, 0.2 second. At t=0 the temperature of rod is zero and the boundary condition are found for all times at T(0) = 100° C and T(10) = 50° C.



SE + 76 Total No. of Pager 14

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S.E. (Mechanical) (Semester - IV) Examination, November-2018 ANALYSIS OF MECHANICAL ELEMENTS

Sub. Code : 63361

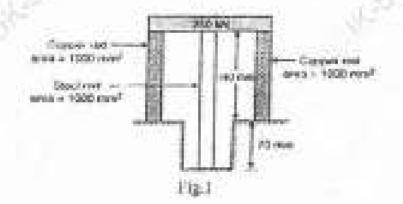
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Total Marks : 100

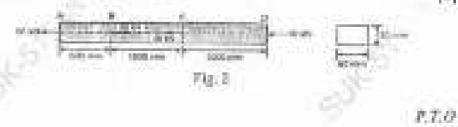
Thue 1 30,400 a.m. is 01,00 p.m.

- festrections: 1) All questions are computery.
 - 2) Assume initiable data wherever measurey and state it elearly.
 - Figures to the right indicate full marks.
 - 40 Brave next and labeled sketches wherever necessary.
 - Ry List of non-programmable colculator is allowed.

(Q1) a) Three pillars two of copper and one of stari support a sigid photorn of 250 kN at above in the fig.1. If area of each supper pillar is 1000 mm² and that of steel pillar is 1000mm², find the unreases developed in each pillar, Length of risel and is 210 mm, length of copper rod is 140 mm. Take E₁=1 = 10⁵ N/mm² and E₁ = 2 × 10⁵ N/mm². (12)



(b) A rectangular bur leaving cross sectional area 50 mm × 20 mm is subjected to axial forces as shown in fig. 2. Finil Total change in length of the bar Take E = 1.05 × 15° Nimm². [6]



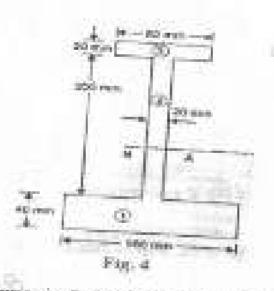
GR:

Determine diamoter of solid their which will manager 90 KW at 160 pm Also determine the length of shaft if ewist must not exceed 1° overlastine length. Tyles maximum show stress on 60 Wurm' and modulus of rigidicy

(22) they SPD and BMD for loading condition shows in fig 3. Locate point of convatigence; and mostimum loading moment if any-<u>j16</u>}



Q3) A cast iren beam has I section with top flange 80 mm = 20 mm, well 200 mm × 20 mm and bottom flange 160 mm > 40 mm, as shown in-Fig. 4 if tenails physics in not to exceed 20 Nimm? what is the maximum UDL the beam carry over a simply supported open of 5 m, if larger flange is in tension. Find also the maximum compressive stress. [16]



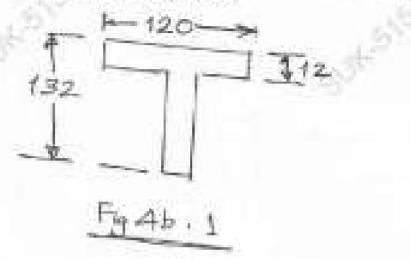
(24) as

Derive the expression for the principal vicesses and maximum shear stress. for a metaber sobjected to like direct stresses in metually perpendicular elirections. Show the locations of principal planatenal planat of maximum

12.5

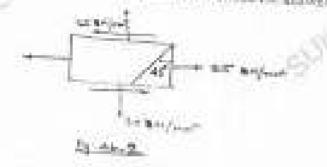
B91

(b) The beam section, shown in figure 46. J is 120 mm × 132 mm + 72 mm T section. Find the streams and show the alwar stress discribution if it his to restart a shear force of 203 kN. MI.



ŪQ.

A polite in a strained material is subjected to stresses as shown in figure. 45.2. Using Mohr's okelo method, determine the normal and tangential strates across the oblique plane. Also check the answer analytically,



Derive the neuration of alops and definetion of a centilever subjected to QO in uniformly distributed load over whole length ming double integration mathed.

A completery beam of spen 3 or is excrying a point load of W kN at the 國任 111 free end, if the moment of inertia of the beam is $1\times 10^9~{\rm mm}^4$ and the modulus of eliasticity is 21 × 10* N/mm², find the stope of cardilarder at the free end if deflection at the free end is 10.71 mer.



SE: 26

[8]

1.634

State the importance of theories of fielding and explain the meximum strain anargy theory.

- (26) a) State the importance of made in Enter's column theory and desired in Supression for the crippling load when both the onds of the column are forged.
 - b) Derive the expression for strain energy stored is a colid shaft due to pure torsion [8]



140

States and

SE - 77 Total No. of Pages : 4

S.E. (Mechanical) (Part - II) (Semester - IV) Examination, November - 2018

FEUID AND TURBO MACHINERY (Revised)

Sub, Code : 63362

Day and Dam: Wednesday, 14 - 11 - 2018 Time : 10.00 a.m. in 01.00 p.m.

Sent

No.

Total Marks : 100

14-22562

Instructions : 1) All questions are compelsory.

- 2) Eligneties to the right indicate fall marks.
- 3) Assures suitable data if successory,
- 4) Use of rost-programmable calculator is allowed.

 Q(I) a) Explain the terms : Hydrautic efficiency, Mechanical efficiency, volumenic efficiency and overall efficiency for hydrautic turbines.
 [8]

b) A politon whiled has a mean bucket speed of 12 m/s and is supplied with water at a rate of 750 litres per second under a head of 15m. If the bucket deflectable jet flootigh a single of 160°, find the power developed by the turbins and its hydraclic efficiency. Take the coefficient of volocity as 0.98. Neglect friction in the bucket, Alao determine the averal, efficiency withe turbins if its mechanical efficiency is 80%. [8]

OR

c) The following data were obtained from a test on a petton wheel : [8]

ii Head at the base of the contril = 32m.

Discharge of the needle = 0.18m \c.

Area of the jet = 7500 sq.mm.

iri) Power available at the shaft = 4-less

Mechanical efficiency = 94%.

Criterine the power loss.

intherigzzle,

1) in the numer

EQ. Introcitation friction

SE = 77

E101

- (02) a) What is a draft take? Why it is used in reaction turbine? Describe with next sketch the different types of draft table. 181
 - b) An inward flow reaction variants discharges radially and the velocity of flow is constant and equal to the velocity of discharge from the turbina-Show that the hydraulic efficiency can be given by -



Where 'a' & '0' are guide vano angle & wheel vano angle at inim. 883

OR

- Determine fre efficiency of a Kaplan turbine developing 3000 low under a 01 ngt hand of hm. It is provident with a draft tabe with its in let (diameter Sail set 1 for above the tail race level. A vacuum gage connected to the draft tabe indicates a reading of 5rs of states. Assume draft tabe efficiency 617836 [81]
- What is minimum starting speed of pump? Derive the equation for the 039 at sene: 183
 - b) Write short notes (any two)
 - printing devices. 9
 - V7SH 101
 - Cavitation in pumps.

OR.

- (c) A contributed pump has an impollint 0 for some character and when matrices at 600 mm discharges were; at the rate of \$000 litratin against a head of 8.5m. The water enters the impeller without whiel and shock. The interdiameter is 9.25m, and the varies are set back at outlet at an angle of 43° and the uses of flow which is constant from islet to outlet of the impellar 5110 is 0.05m². Determine
 - the fundametric officiency of the gump, 油
 - the vers angle is inlet & ιŋ.
 - the least speed at which the pump commences to with

- Q40 a) Explain the working of Reciprocating Compressor and Darive equation for work input required for single stage compressor with adiatatic compressor. [80]
 - b) Write Short notes on any two
 - Importance of Multi staging of emiprocating compressors and how it reduces the required work to run the compressor.
 - 10 Derive expression for workdone by reciprocating compressor with cleanance volume.
 - Write the difference between Recipotenting compressor and Rotary Compressor:

08.

- r) Solve following two problems
 - In single stage air compressor the index of compression and expension may be taken as 1.2. The clearance volume is 1/19° of the swept volume. A compressor of this type is required inpuble of compressing 7.6 cubic meter free air per minute from 160 kPa to 900 kPa. It runs at 240 tpm with a mean pisson speed 220 minut. Find Volumetric efficiency and Diameter of piston. 181
 - I) The Cylinders of two stage air compressor have the same stroke and the maio of their diameters in 2.4 to 3. The delivery pressure in 34 tur and the air supply to the compressor is 1 ber and 17 °C. If the temperature of the air leaving the intercooler is 40°C, find the work done per cubic mater of theo air delivared when the compression in each cylinder is adiabatic. [S]
- Q57 a) Explain the phenomenon of surging, choicing and Stalling in contributation compression.
 - b) A rotary compressive writing between 1 bar and 3.5 tar has internal and external diameters of impeller as 300 mm and 600 mm rospectively. The vane angle at infect and outlet are 30° and 45° respectively. If the air metric the impeller at 15 m/s. Find speeds of impeller in open and worlddoore by compressor per kg of sir. [8]

133

-36

1113

- SE-77
- A contribugal size compressor receives air at a processor of 1 has and 18 °C. 13. and delivers it at a pressure of 6 bar. Determine workdone by the commensor per log of air delivered and best exchanged with the jacket. water offen compression is
 - Inchernal
 - 111 liampopie.
 - 100 Follows law ov "" = constant

Write comment on numbra. Take Cp = 1 kH/kgK and R = 287 J/kgK. [8]

- Q(0,m)
- Explain working of Open cycle Eastarbing with help of Brayton cycle [8]
 - b) In an oil gas nothing lessaliation, air in taken in 1 har and 30 °C. The air in compressed to 4 bar and then heated by liarning the nil to a temperature ac 500 °C. If air flown at rate of 90 kg/min. Find the power developed by: the plant. Takes y for air as 1,4 and Cp as 1 k3/kgK,

If 2.4 kg of irit having calorific value of 40060 k.Ekg is burnt in the combustion manifest per minute, find the overall efficiency of the plant, [8]

OR:

a) - A simple gas turbine takes in air at atmospheric pessare at 15% and compresses the air in the compressor up to 6 ber. These air cours the combrastion chamber and is heated to maximum temperature of 750°C. Then it enters the terbine and expands to atmospheric pressure if the isentropic efficiency of compressor and nublice is 0.8, combustion officiency 0.9, full of pressure through the combustion system 0.1 har, Cp for both nir and gapes 1.005 KJ/kg, 7 = 1.4. Determine the flow of air and gauges for net power of 1100 kW developed. $\{B\}$

7.053

44

11.5355

SE = 78

Total No. of Mages 5.2

S.E. (Mechanical) (Part - II) (Semester - IV) (Revised)

Examination, November - 2018

THEORY OF MACHINES-1

Sub. Code : 63363

Total Marks : 100

181

Duy unit Dute : Thursday, 15 - 11 - 2018

Tisse : 09.50 a.m. to 01.30 p.m.

Sec.

No

Amount of questions. Instructions! 131

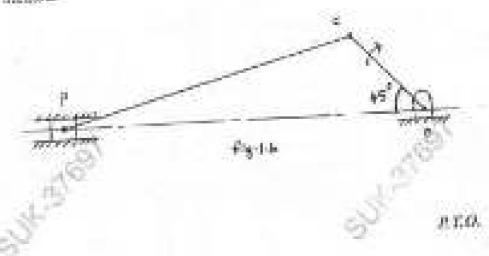
Figures to day eight leaflance full marks to the quantities. 25

- Draw unit tebelog sketch whenever decessory.
- Assume suitable data, if eccasery and state clearly. 25 m
- Use of non-programmable calculator is adviced. 41.1
- 826 Explain the inversions of Our-bar chain with near sketches.

00.0

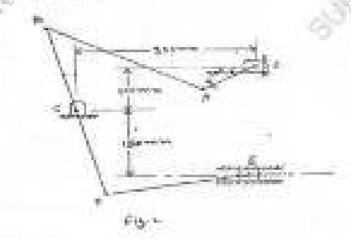
OB.

- Two slights with an angle of 18" between their axes are connected by Horize's joint. The driving shuft new at 1400 r.p.m. The drives shaft but 101 a flywheel of mass 10 kg and radica of gyration 110 thin. Find the mightman at guing acceleration of the driven shaft and the service are too too terings.
 - The courts of an LC, engine to retating at 560 r.p.m. as shown in fig. 1 h. Crank CiC in 60 mm and connecting rod CP is 180 mm in length. Find 心间 velocity and acceleration of the piston by using Klein's occasingtion ingrood.



SE - 78

Q2) In a mechanism as shown in fig.2, the crank OA is 100 mm long and router in clockwise direction at a speed of 100 spam. The straight link BCD is printed at C and the lengths BC and CD are each 100 mm and the link AB is 300 mm long. The 20th DE is 250 mm long and drives slider E. Find the velocity and acceleration of slider E.



(23) a) Cherive the equation for friction tongue in case of flat collar proof bearing assuring defform wear with usual notations.

OR.

- Derive the equation for frighten torque in case of transated conical plots destring assuming uniform pressure with usual notations.
- E) The mean diameter of a square treaded screw jack is 50 mm. The pixils of the thread is 10 mm. The coefficient of friction is 0.15. Determine the force required at the ord of a 0.7 m long lever, which is perpendicular to the longitudinal axis of the screw, to raise a load of 20 kN, reglecting collar friction. [8]

Q40 a) Define following with next diagram:

101

Base Circle
 Pressure Anale

ii) Print curve
 iv) Printe Curcle

 From the following data draw the profile of case in which follower moves with SHM during ascentiand with uniform acceleration and relation doring descent;

Minimum ratios of ram = 50 mm, Angle of ascent = 48°. Angle of Dwell = 42°, Angle of Descent = 60°, Lift of inflower = 40 mm, Roller Diameter = 30 run Distance between line of action of the follower and asis of cam = 20 mm. [12]

 $r^{2}r$

SE - 78 161

221

SUNCERE

Explain Slip and Croep ptenomenon in Bult.

08

(i) Derive condition for maximum power transmission in Belt Drive

b) In millipen belt drive, the dismoner of the larger and the smaller pulleys are 1.2 m and 0.8 m respectively. The smaller pulley rutates at 320 rpm. The center distance between the shafts is 4 m. When stationary, the initial tension in the belt is 2.8 kN. The mass of the belt is 1.8 Kg/m and metflorent of friction between the belt and pulley is 0.25. Determine power transmitted by belt crutisidering centrifugal tension. 1101

Q6(4) Explain the terms arraitive tess, sublity, isochronism and hiarting related with governoes. [6]

UR.

- a) derive the equation for height of Porter powersre-
- b) Each ann of Porter governor is 300 mm long and is pivoted on the action of the governor. The radii of rotation of the balls at minimum and maximum speeds are 120 and 160 mm respectively. The mass of the sleeve is 24 kg and web balls a 4 kg. Find the range of spanitof governor. Also determine the range of spanitof governor.

000

-3-

SUKES

SE - 805

Tetal No. of Pages 7.2

Total Marks: 100

Stat No.

S.E. (Mechanical) (Revised) (Part - II) (Semester - IV)

Examination, November - 2018

MACHINE TOOLS AND PROCESSES

Sub. Code: 63364

Day and Date : Friday, 15 - 11 - 2018

Time : 10.00 n.m. to 01.06 p.m.

D All Questions are compulsory.

- 25 Figures to the right indicate full marks.
- 26 Aissone suitable data, if necessary,
- 4) Use of Non-programmable Scientific Calculator is allowed.

QD Attempt my four of the following :

-63	State advantages and limitations of metal mating processes	141
p_{i}	Draw a neat skotch of gating system.	141
$\{ i \}_{i \in I}$	Explain important properties of core sand,	141
41	Which casting method is used to produce piston rings? Explain in brief.	the same
$\dot{\eta}_{\rm c}$	What are the different methods used for eleaning of easting?	[4]

Q2) Attempt any four of the following :

43	Explain with near sketch closed die forging process.	143
10.	Define Extrasion and Explain with new sketch tube extrasion proces	1.141
$ 0\rangle$	Explain the process of wire drawing in brief,	[4]
$ \mathbf{f}\rangle$	State types of rolling mill. Draw a nest sketch of any one of them.	[4]
4	What are the defects associated with the extrusion process?	141

Q3) Write a short note on (Any Three) :

10	Examples of blow melding for production of plastic parts.	163
(p)	Thennoforming	162
	Application of forging	[0]
а,	Cupula firmace	[6]



Q4) Attempt any four of the following :-

-10	Calculate the gene train for cutting the 8 TPI pitch on work piece (Cit- head screw of lathe is 6 TPI. [4	
	The lathe is supplied with a change year set from 20 to 120 feeth in step of 5 tooth and an additional year of 127 teeth.	ŝ
bf	Compare turret lathe & capstan lathe, 57 [4	ŧ.
\vec{v}	State principal parts of fathe & explain its function. [4	ł.
d)	State and holding devices condrilling machine. Draw sketch of any two [4	È.
a_{i}^{k}	Explain construction of vertical boring muchine, [4	ř.

(25) Attempt my four of the following :

49	Draw next skotch of operations performed on planning machine.	340
\mathfrak{b}	State various operations performed on shaping machine.	[4]
e_{1}	Explain constructions of vertical milling machine.	141
(q)	Describe vertical milling attachment on horizontal milling machine.	141
10	With the help of next skenth explain gent hobbing process in brief.	[4]

@4) Write a short note on (Any Three):

132

10	Laser beam machining	161
b)	Electro-obernical machining	[0]
18 M.	Jig baring machine	[6]
4	Types of milling outtens	(6)

124

Martin Co

SF-83 Tend No. of Paper 1 d

S.E. (Mechanica)	Engineering) (Semester - IV)
Examinat	ion, November - 2017
APPLIED NU	MERICAL METHODS
Sub	Code: 63360

Day and Date : Wednesday, 01 - 11 - 2017 Time : 10.00 a.m. to 1.00 p.m.

Sect

No.

Total Marks ; 100

151

 $[2 \times 5 = 10]$

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57926496486765	102	and the second sec	

- 2) Make subtable assumptions / data if required and state clearly.
- 3) Drow near startches wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of Coloniator is allowed.
- Q1) a) Explain types of errors.
 - b) Solve any two:
 - 0 Using bisection method, find the negative root of $x^3 4x + 9 = 6$.
 - ii) Use Newton Raphson Method to eviduate the \sqrt{21}.
 - #Ind root of the equation x e⁺⁺ = 0 using securit method with four iterations.

Q2) a) Solve the following equations by Gauss Elimination method [5].

32+2-2=3 $2\alpha-8\alpha+z=...4$

x - 2p + 9p = 8.

b) Solve any two

- $[2 \times 5 = 10]$
- Solve the following equations by Gauss Jordan method 2x + y + z → 10 3x + 2y + 3z = 18

 $x \pm 4y \pm 9z = 10$

SE-83

ii) Solve the following equations by matrix inversion method.

$$3x = y - 2z = 3$$

$$2x - 3y - z = -3$$

in) Solve the following equations by Gauss-Seidel method

$$2x + y + 5z = 9$$

 $8x + 3y + 2z = 13$
 $z + 5y + z = 7$

Q3) Solve any four

$[4 \times 5 = 20]$

a) Fit a least square curve y = as to the following data

$ \mathcal{X} $	1.1	2	3.	4	5
ÿ.	0.5	2	4.5	8	12.5

 Find the missing turn in the following table using Lagranges's interpolation formula

8	0	1,-	2	:3:	- 4
\mathcal{R}^{-}	1	÷.	- 0	Rec.	81

2) Using Newton's divided difference formula, evaluate f(9)

π -1	-1 0		2	5	
f(x) = 12.45	33	5	39.	1335	

d) Find the mean and meditan

Marks	8-10	10-20	20-30	30-40	40-50	50-60
No. of Students	12	18	27	20	17	- 6

(c) What are the applications of Binomial distribution and normal distribution?

Q4) a) Evaluate $\int 1/x_{cold}$ by Simpson's χ_{3}^{cold} rule with 4 surips. [4]

- b) Solve any two i
 - Compare the integral 1= [x e^x dc by Gaussian Quadrature. [6]
 - Fivefunce the integral ¹
 ¹
 (x/sin x) dv using Romberg's method, correct to three decimal places
 [6]
 - The population of a certain town is shown in the following table : [6]
 Year (x) ; 1931 1941 1951 1961 1971
 Population in lakins (y) : 40.62 60.80 79.95 103.58 132.55
 Find the race of growth of population in 1961.
- **Q5**) a) Solve $\frac{d2}{dr} = p^2 + x$, p(0) = 1 using Taylor's series method and compute p(0.1) and p(0.2). [6]
 - b) Solve any tran
 - i) Using modified Euler's method, fluid y(0.2) and y(0.4) given y' = y + e', y(0) = 0. (5)

Apply Ronge Kutta method to find approximate value of y for x = 0.2, in steps of 0.1, if $\frac{dy}{dy} = x + y^2$ given that y = 1 where x = 0. [5]

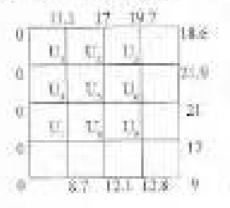
(ii) Find the largest Eigen value and the associated Figen vector,

$$A = \begin{bmatrix} 1 & 3 & -1 \\ 3 & 2 & 4 \\ -1 & 4 & 10 \end{bmatrix} \text{ by power method.}$$
[5]

SF-83

Q6) a)

 a) Solve the equation u_{in} = n_p = 0 for the following square mesh with shown boundary values. [10]



b) Solve any two :

17	Closelfy the following partial differential equations.	141
	1) $y^2 w_{\mu} + 2y, w_{\mu} + w_{\mu} - w_{\mu} = 8y$	
	2) $y^{\mu}y_{\mu\nu} - 2ny, \ \mu_{\mu} + x^{\mu}\mu_{\mu} + 2\mu_{\mu} - 3\mu = 0$	
ii)	Explain Crank Nicolson method.	141
100	Explain Bender-Schmidt method,	141

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SF = 84 Tatal No. of Page 131

S.E. (Mechanical) (Semester - IV) Examination, November - 2017 ANALYSIS OF MECHANICAL ELEMENTS Sub. Code:63361

Day and Date : Thurnday, 62 - 11 - 2017 Tirte : \$0.00 p.m. to 1.00 p.m.

Total Marles : 100

Instructions :

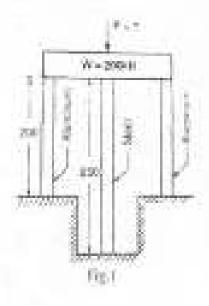
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1] All quantinus are compulsory.

- Anvarue suitable data wherever necessary and state is duarby.
- 3) Eigenes to the eight indicate fall marks.
- 4) Draw next and labeled statistics wherever necessary.
- Use of non-programmable calculator is allowed.
- Q1) a) Three pillers two of aluminum and one of steel support a rigid platform of 200 kN as shown in the fig.1. If area of each shiminum piller is 5000 mm² and that of surel piller is 800mm², find the stresses developed in each piller.

Take $E_a = 1 \times 10^4$ N/mm² and $E_a = 2 \times 10^5$ N/mm². What additional load P, can it take, if working streases are 65N/mm² in aluminum and 150N/mm² in steel? [12]



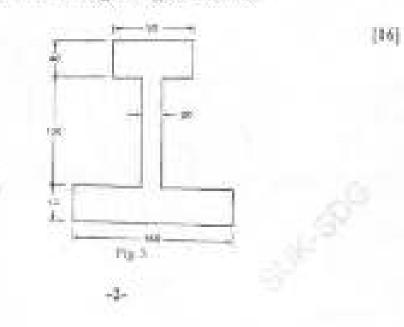
- SF 84
- b) Explain thermal stresses and hence derive the expression for thermal stress indiced in a bar with its ends fixed by rigid support. [6]

OR-

- b) A hollow circular shaft 200 mm external diameter and thickness 25mm is transmitting power at 200 mm. The angle of twist over the length of him was found to be 0.5°. Calculate this power transmitted and the maximum show stress induced in the shaft. Take modulus of rigidity as 84 kNe sand [66].
- (22) Draw SPD and BMD for loading conductor shown in fig 2. Locate point of controllectore and maximum bending moment if any. [16]



Q3] A cast into beam has I section with top flange 80 mm ×40 mm, wed 120 mm ×20mm and bottom flange 160 mm×40 mm, as shown in Fig 3 if tenaile stress is not to exceed 20 N/nm² and compressive stress 50N/mm², what is the movinum UDL the beam can carry over a simply supported open of 6m, if begin flange is in tension.

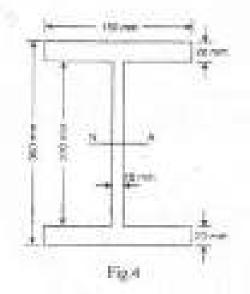


SF - 84

- Q4(a) Therive the expression for the principal speases and the maximum share stress for a member subjected to simple shore stress. Show the locations of Principal Planes and Planes of Maximum shere stress. [9]
 - b) Af a point in a strained material the principal straines are 140N/mm² (travilational 50 N/mm² (compressive). Determine the normal stress, shear stress and the resolution stress on a plane inclined at 45% and a definition Principal stress. What is the intervity of maximum shear stress at the point?

OR:

(b) An I-section beam 350mm +150mm has a well thickness of 10mm and a flange thickness of 20mm (Fig. 4) If the shear force acting on the section is 40 kN, find the staximum above stress developed in the I-section. Also shouth the shear stress distribution across the section. [9]



Q51 a) Derive the expression for slope and deflection of a simply supported beam subjected to an UDE for the whole spost, using double integration method. [8]

SF - 84

b) A contilener of length 2 m carries a UDL of 2 kNon over a length of 1 m from the free end and a point lead of 1 kN at the free and. Find the slope and deflection at the free end if E>2.1 × 10⁶N/mm² and I=6.667×15/mm²[8].

COR.

- b) State the importance of factories of failure and explain the maximum Principal stress theory.
- Q6) a) State the resumptions made in Euler's column theory and derive its expression for the crippling haad when both the ends of the column see hinged. [8]
 - b) The maximum stress produced by pull in bar of length Ini is 150 Nimm². The area of cross sections and lengths are as shown in fig 5. Calculate the strain energy stored in a box if E=2×10⁸N/mm³

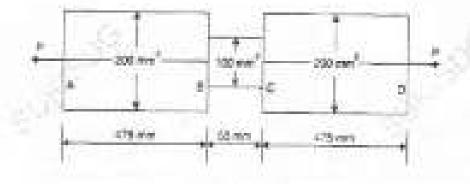


Fig. 5

2 2 2

SF - 85 Total No. of Pages : 4

Seat No.

S.E. (Mechanical) (Part - II) (Semester - IV) (Revised) Examination, November - 2017 FLUID AND TURBO MACHINERY Sub, Code: 63362

Day and Date: Friday, 03 - 11 - 2017 Time : 10.00 a.m. tw 1.00 p.m.

Total Marks: 188

lastriction :	15%	All questions are compulsory,	
	C. P. L. C.	the second se	

- 2) Figures to the right indicate foll marks,
- 3) Assume suitable data if necessary.
- 4) Use of non-programmable calculator is allowed.

Q1) a) Explain the different efficiencies of the turbine, [8]

b) The following data were obtained from a test on a Pelton wheel [88]

- Head at the base of nozzle = 32m
- Discharge through morely = 0.18 m^{1/s}:
- Acca of the jet = 7500 mm².
- iv) Power available at the shaft = 44 kW
- v) Mechanical efficiency = 94%

Calculate the power lost

- In the nozzle.
- 2) To the runner
- In mechanical friction

OR.

c) A turbine work under a head of 200 m and it develops 6000 kW at 200 rpm. The overall efficiencies 87%. Find its unit quantities. A model is to hall which is similar to above turbine in all respect having the scale 1:10, it is tested under a head of 20m. find the speed, discharge and specific speed of model having the same overall efficiency as turbine. [8]

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(02) = 0

What is governing of turbine? Explain governing of Francis turbing with SF - 85

181

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181

[101]

An invarid flow reaction turbing has noter diameter of 1m and inner bù. diameter 0.5m. The values are racial at the infer and discharge is radial at the outlet. Water enters varie at an angle of 10^e. Assuming velocity of flow to be constant at 3m/sec. First speed of the wheel and same angle of outlin.

OR.

A Kaplan nurbine works under head of 16m. Runner diameter is 2.5 368 times diameter of hub; speed of turbine is 105 rpm. Angle of varie tip of outlet extreme edge is 20° and K₀=0.6.

Assume radial discharge,

Calculate () Runner diameter

> Hubdlamster 37.

Discharge through turbing 1631

- 03[(1)] Define specific speed of pump and obtain expression of it. What is significance of it?
 - <u>685</u> Write short notes (ing two) [8]

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661

Durine expression for minimum starting speed of centrifugal proop.

- ÖR.
- A centrifuger pump is coming at 1000 rpm. The confer vace angle of а. impeller is 45° and velocity of flow at out 2.5 m/sec. Discharge through pumps is 200 //t/see working against total head of 20m. If manoepetric efficiency is \$0%, find impeller diameter and width of impeller ar outlet.
- Centrifugal pump of impeller diameter 0.30m discharging 0.03 m//s 180 water against it total head of 15 m and the pump is raming at 1000 rpen. Find the discharge, head and ratio of power of a geometrically similar pump of diameter 0.15 m when it is cunning at 2500 rpm [5]

1991

Q4) a) Prove that the expression for volumetric efficiency in reciprocating compressor with effect of clearance volume is

$$\sigma_i = 1 - \frac{V_e}{V_b} \left[\left(\frac{P_i}{P_i} \right)^2 - 1 \right]$$

Where,

V₁ is Clearance volume, V₁ is swept volume and P₂/P₁ is the pressure ratio. Also discuss the effect of Cleanance ratio on the volumentic efficiency of the compressor. [8]

- b) Write short notes on any two-
 - Requirement of multistage of reciprocating compressors.
 - Workdone by reciprocating compressor during adiabatic and inothermal compressions.
 - Classification of reciprocating compressors.

OR .

- b) b A single acting single stage compressor is belt driven from an electric motor at 400 rpm. The cylinder diameter is 15cm and the stroke 17.5 cm. The air is compressed from 1 bar to 7 bar and the law of compression PV⁽¹⁾ = Constinut. Find the power of the motor, if transmission efficiency is 97% and the mechanical efficiency of compressor is 90%. Neglect elemance effect. [S]
 - ii) The pressure in the mains of compressor air service in to be 8 bar and a supply of 28 m³/hr at 15% and that pressure in to be maintained. The air is compressed from an initial pressure 1 bar by a two stage compressor in which the compression is adiabatic. The air is cooled to its initial temperature of 15% in the inter cooler. What is the minimum power required to compress the air? Trice R = 287 J/kgK. [5]
- Q5) a) Explain the concept of Slip factor and Power input factor. [8]
 b) A Centrifugal compressor delivers 40 kg of air per minute at a pressure of 3 has used 120° C. The intake pressure and temperature of the air is 1 has and 25°C. If no heat loss to the surrounding, find
 - Index of compression
 - i) Power required, if the compression is isothermal

(Toke R = 287 J/kgK and C_e = 1.005 J/kgK)

18]

OR

- b) An axial flow compressor with compression ratio 6, draws air at 25°C, delivers it at 60°C. Assuming 50% degree of reaction, find the velocity of flow if the blade velocity is 100 m/sec and also find the number of stages. Take work factor = 0.85, α = 10° & [5, ~ 40°, C = 1 kJ/kgK.[8]
- Q6) a) Give the methods of improving the specific output and thermal efficiency of gas turbine and explain gas turbine with intercooling terangement. [8]
 - (b) An open gas turbine plant works between the fixed absolute temperature limits 350 K, 1550 K, the absolute pressure limits being 1 bar and 14 bar. The isentropic efficiency of compressor is 0.85 and that of torbine 0.86. Estimate the net work done by the turbine. The calorific value of the fael is 4200 kJ/kg.

Assume:

Efficiency of combustion chumber is 0.99,

Mechanical afficiency of whole assembly is 0.98.

Efficiency of generator is 0.985

Fuel air ratio = 1 : 54.06 and m_g = 500 kg/s. Take Cp = 1.005 kJ/kgK for air and gas. [8]

OR

- b) Operating conditions of the Gas turbine unit are given below
 - The isentropic efficiency of compressor = 0.85.
 - The isentropic efficiency of turbine = 0.82.
 - A turbine unit has a pressure ratio 7:1
 - Maximum evels temperature is 620°C.
 - (ii) The air enters the compressor at 15°C at the rate of 20 kg/s.

Then stainulate the workdone by turbine, compressor work and total work.

Take Cp = 1.005 kJ/kgK and $\gamma = 1.4$ for the compression and Cp=1.11 kJ/ kgK and $\gamma = 1.35$ for the expansion. [8]

SF-86 Tetal No. of Pages : 3

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in Staty II.		
	Construction of the second second second	

S.E. (Mechanical) (Part - II) (Semester-IV) (Revised) Examination, November - 2017 THEORY OF MACHINES - I

Sub. Code : 63363

Day and Dute : Monday, 06-11-2017 Time : 9.30 s.m. to 1.30 p.m.

Total Marks (100

181

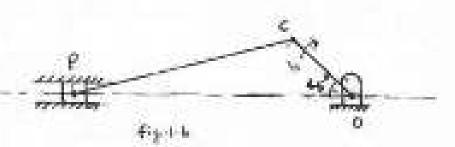
- Instructions :
 - Attemptalliprestions.
 - 2) Figures to the right indicates full marks.
 - Draw next labeled sketch wherever necessary.
 - d) Assume suitable data, if necessary and state clearly,
 - 5) Use of non-programmable calculator is allowed.

SECTION-I

Q1) a) Write b note on Grubler's criterion for planar mechanism.

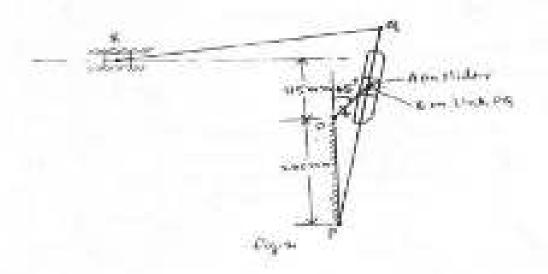
OR:

- Explain the inversions of single-slider crank chain with next sketches [8]
- b) A reciprocating englise mechanism is shown in the Lb. Crank OC is 60 mm long and connecting rod CP is having length of 180mm. By using Klein's construction method, find the velocity and acceleration of the piston if the crank is rotating at 180 r.p.m. [8]



SF-86

Q2) Crank OA of the quick return machanism shown in fig. 2. revolves at a uniform speed of 250 r.p.m. in clockwise direction. The dimensions of various links are: OA = 75 mm, PQ = 375 mm, and QR = 400 mm. Craok makes 45° with vertical line PO. Find: i) velocity of R, ii) acceleration of R and iii) angular acceleration of QR. [18]



Q3) a) Derive the equation for friction torque in case of conical pivot bearing instaning uniform pressure with usual notations. [8]

ΟR.

- a) Derive the equation for friction torque in case of flat pivot bearing assuming uniform pressure condition. [8]
- b] A serew jack has square threaded screw with mean diameter of 40 mm. The pitch of the thread is 6 mm and the coefficient of friction at the screw is 0.16. The load to be lifted is 25 kN and is supported by a cellar baving mean diameter of 50 mm and the coefficient of friction at the rollar is 0.18. Determine the length of the tommy bar required if an effort of 200 N is applied to lift the load. [8]
- Q4) a) Draw displacement, velocity and acceleration diagram for Uniform acceleration and retardation motion program of follower. [4]

[6]

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 b) A carn is operating an oscillating roller follower having SHM during intoward and return stroke. Draw the carn profile for the following given string;

Distance of coller centre from cam centre at the start of ascent = 60 num;

Follower arm length = 80 mm; Distance of pivot point from eam centre = 100 mm;

Angle of ascent = 60°; Angle of descent = 90°; Angle of dwell in between = 45°

Angle of oscillation of follower arm during escent and descent = 15"[14]

Q5) a) Derive the equation of ratios of belt tensions in case of flat belt drive.[6]

OR:

a) Explain alip and cremp in belt.

- b) An open belt running over two pulleys 240 mm and 600 mm diameter connects two parallel shafts 3m apert and transmiss 4 kW from smaller pulley that rotates at 300 rpm. Coefficient of friction between the belt and pulley is 0.3 and safe working tension is 10N per mm width. Determine minimum width of belt, initial tension in belt. [10]
- Q6) a) Explain controlling force and controlling curve,

OR :

10 Explain the terms height of governor, Isochroniam and stability related to governor. [6]

b) In a porter governor, each of the four antis is 400 mm long. The upper truns are proceed on the axis of rotation whereas the lower arms are strached to the sleeve at a distance of 45 mm from the axis of rotation. Each hall has a mass of 8 kg and the load on the sleeve is 60 kg. What will be the equilibrium speeds for the two estateme radii of 250 mm and 300 mm of rotation of governor balls? 1101

-34

SF-87 Total No. of Pages : 2

Sent Ns.

S.E. (Mechanical) (Part - II) (Semester - IV) (Old) (Pre-revised) Examination, November - 2017 MACHINE TOOLS

Sub. Code: 43595

Day and Date : Wednesday, 01 - 11 - 2017 Time : 10.00 n.m. to 1.00 p.m. Total Marks : 110

Instructions: 1) Answer any these questions from each Section.

2) Figures to the right indicate full marks.

2) Assume suitable data, if necessary,

4) Use of Non-programmable Scientific Calculator is allowed.

SECTION -1

Q1) a):	State and explain various operations performed on lathe?	(8)
5)	Describe with neat sketch any two intachments used on lathe.	[8]
Q2) a}	What are principal parts of Radial drilling machine? State the funct	tion of 181
61	Explain construction and working of horizontal boring machine?	[8]
Q3) a)	With the help of near sketch explain turret indexing mechanism.	[8]
b)	Sketch various types of tools used on boring machine.	[8]
Q4) Wr	ite a abort note on (Asty Three)	[18]
03	Various accessories used on lathe.	
5)	Table drive and feed meritanism in platter.	
\$3	Hydraulie shaper.	
18	Champeterizies of multice mole.	

SECTION - II

Q5) i	ų n	Explain vertical milling attachment for horizontal milling machine.	[8]		
	1	Sketch and describe the functions of the following milling cutters 0 side milling cutter.	[8]		
		ii) Eind mill owner.			
		iv) 7-slot cutter.			
Q6) a	ð.	What we the commonly used shapes and sizes of grinding wheel?	181		
2	b) Describe the working principle of tool and cutter grinder. What a				
		uners?	[8]		
Q7) a	Øŝ.	List gear finishing processes. Explain gear shaving process.	[8]		
b	9	Explain construction of CNC machine with block diagram.	181		
Q8) 3	Wei	te a short note on (Any Three) :	[18]		
3	ł.	Cylindrical grinder.	-210-		
b	ð -	Classification of milling Machine.			
¢	ŝ.,	Gear shaping.			
d	Ŋ.	Advantages and limitations of broaching,			

-2-

SF - 996 Total No. of Pages 13

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S.E. (Mechanical) (Part - II) (Semester - IV) (Revised) Examination, November - 2017 MACHINE TOOLS & PROCESSES

Sub. Code : 63364

Day and Date : Taesday, 97 - 11 - 2017

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

Total Marks : 160

- Instructions: 1) All Questions are compulsory.
 - 1) Figures to the right indicate full marks
 - 3) Assume subable data, if accessory,
 - 4) Use of Non-programmable Scientific Unkulator is allowed.

Q1) Attempt my four (4 marks each) :

	4)	Explain the properties of molding sand. Suggest the methods to me the same.	isure [4]
	5)	State the function of ciser in the gating system.	148
	$\mathbf{c})$	What are the steps involved in gravity die casting,	[4]
	d (Draw next sketch of cupela firmace and name the parts.	[4]
	2)	List the defects related to molding process? Explain any two of these	n.[4]
Q2)	Ait	oupt any four (4 marks each)	
	43.	Briefly explain principle of colling with near sketch.	[4]
	${\rm In}$	Distinguish between open and alosal die forging processes,	141
	c)	Show by schematic slutches the process of forward extrusion, two examples of components produced by extrusion.	Give [4]
	d)	Why is lubrication difficult in wire drawing process? State the met generally employed in it.	hods [4]
	e)	Indicate by means of flow diagram the different stages in manufactor 50 mm diameter rod from a seed ingot.	re of 141

Q3) Write a short note on (Any Three) :

43	Advantages and Limitations of sand casting process	[6]
b)	Defects in Roging	[6]
$\{c\}$	Injection molding	[6]
$d \Sigma$	Thermoforming process for plastic	[6]

Q4) Attempt any four (4 marks each)

	0	A lathe is provided with a change gear set from 20 to 125 teeth in ste of 5 teeth and an additional gear of 127 teeth. Find the gear train outling metric thread of 3 mm pitch on a lathe having lead screw pitch 6 TPL	ĥe.
	b)	 Fig. 9 (2014) Fideo Ante Astronomy Televice and sectors and sectors in the sector sector. 	ny [4]
	63	Describe in brief working principle of boring machine.	41
	(ð);	Draw near sketch of following operations performed on drilling muching	14) 4
		b Countersinking	
		ii) Counterboring	
	e)	Give the specification of tathe.	4 1
Q5)	A0	empt any four (4 mirks each):	
	0	Explain the method of energing and an operation on shaper []	91
	bb	Outline the procedure of planning vertical surfaces.	912
	9))	Make a near sketch of Universal milling machine. State its advantages.	(4)

- d) What are various tool holding devices used on milling machine? [4]
- compare the gear showing with generalling, [4].

Q6) Write a short note on (Any Three)

10	Abrasive Jet Machining advantages & limitations	[6]
b)	Application of Electro-Chemical machining with near sortch	[6]
(6)	Water jet machining process	[6]
्य	Various operations performed on milling machine	[6]

SJ-320 Total 3m of Pages :4

S.E. (Mechanical Engineering) (Semester - IV) Examination, November - 2016 APPLIED NUMERICAL METHODS Sub. Code : 63360

Day and Date: Monday, 07-51-2010

Total Marks: 100

Time 3,38 p.in. in 5,30 p.m.

Seat. No.

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- framericanti II diquestionsi
 - 1) Make enitable occuraption what, if enquired and state clearly-
 - 3) Draw and doctation whorever measures.
 - +) Digenes to the right indicate full marks.
 - 2) Unsof calculater is altered
- (Q1) (a) If the length of a bridge and a riser measured by you are 9999 ers and 9 controportively, while the true values are 10000 an and 10 cm respectively, compute
 - i) domeanead
 - it the percent obtain a strin for with case.
 - (b) Sales ary too

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- b Use the method of faise position, to find the fourth nort of 32 current to these decimal places.
- () Using Mutter's method find the mot of equation

1 + 7a - 4ar x = 0 (Take $a_1 = 1, a_2 = 1, 4$)

- Find the real may of not 2 = 0 using Newton Repheres method.
- (Q2) a) Solve the system of equations taking UU Decomposition method. [5]

7x+2y-3z=-18 x-2y-3z=-187z-z-9y=-28

87.O.

- b) Solve any mo-
 - () Solve the following equations by Gauss Seidal method
 - -381+49-2-31
 - x = 2y + 10x = 25
 - 2x = 17 + 4x = 23
 - (i) Some the following equations by matrix invention method.
 - 1+3+2=3
 - 4+33+3554
 - 1+47-67-8
 - (iii) Solve the following equations by Closes Eliminetam method
 - 310 10 22-2
 - It-Jy-zwell
 - 4-211244

Q35 Solverny for

[429:20]

SJ-320 [2×5-10]

 Oritain a relation of the form p = 4x⁺ for the following data by the method of least squares.

1960 - C	Т.	÷.	3	#	
T	2.1	27.8	62.1	110	365

b) The following units gives the viscously of online function of temperature. Use Lagranges's interpolation formula to find viscously of other temperature of 140°C.

Temp®C	110	138	160	.90
Macosity	10.3	- 63	\$5	-48

c) Using Newton's divided difference formula, evaluate 1(8)

老 田	<u>4</u>	5	1	19	T.	44
/00	18	103	294	900	1210	2028

SJ-320

d) State addition and Multiplication law of probability.

e): Compare the standard deviation of 100 studests.

Mass it Kg	60:62	13-65	65-58	//9-21	72.74
Ng.: f	(2)	.18	42	22	8

(i) a) A reacker is humahed from the ground, its acceleration is registered during the first 80 seconds and is given in the table below. Using Simpson's 1-1 rate, find the velocity of the eacker in the Sh seconds. [4]

s (sec) 1 0	30	24	30	20	-20	.60	70	R0
((100) (10)) (100) (10)) (100) (10)) (10)) (10)) (10)) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100) (100)	32,63	1834	3847	37.75	40.50	43.25	46.69	\$0.67

b) Solve buy two

6 Evaluate 2 - " in using the 1-point Gaussian Quadrature: [6]

[4] Fundamenta integral [100, 2.47 using Komberg (enothed, given that, 5)

ű.	. 44	12	2,4	4.5	4.5	3	52
y 1.	Lost	1.6331	1.6836	1.526	1.5685	1.6094	7.6985

(ii) The distance travelled by a point P in X-Y plans in a mechanism in as shown in the table below. Estimate the distance travelled, value sy metanceleration of paint P wixmer 4.5 167

x(mm)		2	1	+	1 E.
y (um)	.ja	30	62	136	161

SJ-32

QS) x) Apple Barge Katta method to finit approximate value of y for x = 0.2

) if if
$$\frac{ds}{ds} = \frac{dx_0^2 + s^2}{s^2 + ss^2}$$
 given $x_0 = 1, y_0 = 0.$ [6]

hi Solve any two

- 1) Lise Failer's method to solve dy/ab = 2 + que , y (0 =). Find y (1 = by taking 5 steps.
- The Pind or opproximate value of y where s = 0.1, if dy/dr = x y² and y = 1 at x = 0 using Picord's method.
- (ii) Find the largest Figer value and the assorthed Figer vector []

$$A = \begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 2 \end{bmatrix}$$
 by prove method.

Q(i) a) Solve the organization at the site for the following square much with show on the solution of the solutio



hit - Solve one two-

Classify the following partial differential equations

1) 514, 44, 44, 44, 44, 41, 41, 41

10 Explain Crarie Nicolous metitod

(ii) Use explicit mutbol to solve for the insperature distribution of long thin rod within length of 10 cm and following values in whether

 $\Delta t = 0.1$ accord and A =0.0303 at time t = 0.1 second, 0.2 second out = 0.1 second the boundary county

are fixed for all dimensit T (0) = 100" U and T (10) - 50°C.

- Arie

Sec. 1	
20204	and the second se
No. of Concession, Name	
1.	
	and the second se

SJ-321 food Net Streps + 3

S.E.(Mechanical) (Part-II) (Somester - IV) Examination, November - 2016 ANALYSIS OF MECHANICAL ELEMENTS Sub. Code (6336)

Day and Date: Trenday, 8 - 11 - 2016 Time : 2.34 p.m. to 5.36 p.m.

Total Marks / 388-

Mittuellage :

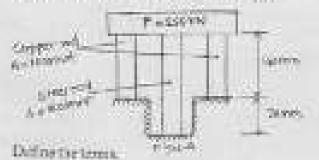
10

All-question are compalicity.
 Accumentation for the second s

D. Accuse estudie day, whereas accusery and sum Releases.

3) Figure to the right indicate to firmarks.

(20. a) Two copper code and one seed red together support a lond of 250KiN as shown in fig. 1-6. Calculate load and atreases for each rod. Assume his=2×10° N/mm² and Ecw1+(0⁴ N/mm². [12])



0 Bulkmennin

O Modulus s'rigidity

in Writera's min

OR.

3) A start is transmitting 97.5KW at 1800pm. If the allowable stress is the summing is 60MPs, Pied Siz writted diameter for the shall. Also find the shaft frameter from righting considerations. If the allowable twist in the shaft is P^{*} in a length of Im. Take G: 20GPg. (b)

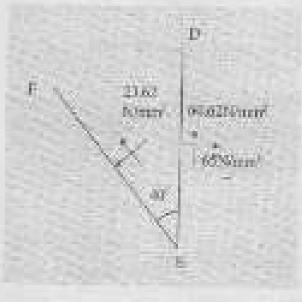
B.T.O.

461

- SJ-321
- (2) Draw SPD and BMD for teasting condition shows in fig.2. Locate grant of subsenior if any. [14]



- (23) A.T-section of simply supported beam of flarge and web dimension 100 mm-S0 mm such. It is adojusted under B.M. of 3.4KN in Find streams at extreme fibers of cross section and show the stress distribution. Also calculate modimensise force and compressive factorial section. [16]
- Q40 a) Derive the expression for principle scenes and maximum shere stress for a member subjected to simple their times. Also show the locations of principle planes and planes of maximum shear stress. [8]
 - Fig 1.Stows for mental and targential aboves on two planeal Dearmine the principle strivers. [10]



OR:

1.20

The abey force using on a section of been is 50 kN. The section of beam 66 and its distances are as shown if Fig2. The moment of inext school the honisticated neutral anis is 314.321 -107 trans. Calculate the shear stress at the personal axis and at the junction of the web and the fillings. Also show the shear sowe distribution. 1100

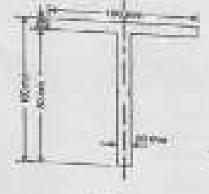


Fig1

- Device the expression for alope and deflection of a cardinger antijected to uniformity doer brand (pad (LUM)) to sadistance is ' from the Sand and using double integration coefficial. 191
- A cantilever of length 2 measures a stritomay dear based load of 2.5 kNo 80 mounter a length of 1.25 m from the fixed and a point lost of 1454 at the free stid. Find the deflection at the iree, end if the section is racinguage 12 cm wide and 24 cm deep and I'm 1 a 117 Normal 181

COL.

- in. Suce that importantly of factories to faither and exploits the maximum datar stress Theory (Goost's Theory). \mathbf{W}
- Explain the soncept of openation length and stendermore min of the 6.Car. 1 rodurn. Discuss the irritation of Enter's formula, $\{3\}$
 - his Derive the compression for the strain every stored in a world shell due to POPP ROCKERS. 188

1.34

SI-321

SJ-322 Total No. of Pages ; 6

S.E (Mechanical) (Part-II) (Semester-IV) Examination, November - 2016 FLUID AND TURBO MACHINERY Sub, Code :63362

Day and Date : Wednesday, 07-11-2016 Tune : 2:30 p.m. to 5:39 p.m.

Total Marine: 188

Instructions).

Seat

Sec

- 2) Aligaration area separate.
- 2) Wigness to the right inductor foll exercise.
- Ansana mitable data & necessary.
- O Utrolnet-programmable submission is allowed.
- Q1) a) Explain the terms, overall influences, jet mine speed ratio and coefficient of velocity. (31)
 - b) A pellem wheel is working under a grossileral 400m. The water is scopplind through perseteck of diameter 1 m and 4 Km length from enservoir to the pellem wheel. The exclusion of Siction for the pentatek is growt as 0.4%. The jet of seater rismost 150mm unites the bucket of the wheel and persidefies tell through 155°. The relative velocity of occur at patients ordered by 15% the tellifectors between initials surface of the bucket and water. If the weight of backet is 0.4% times the jet velocity at initials and water. If the weight of backet is 0.4% times the jet velocity at initials or discussion of the bucket and water. If the weight of backet is 0.4% times the jet velocity at initials of the second of the bucket is 0.4% times the jet velocity at initials of the second of the second of the second of the bucket and water. If the velocity of backet is 0.4% times the jet velocity at initials and the second of the second of the second of the second of the second treatment of the second of the
 - Find B Powerpires manage

iii Shafi power

ii)Hydraila etfisioney.

OR-

- A pelson wood has to develop 16.5MW under head of 800 or White turning at 400 mp of overall efficiency of 85%. Accuming substitutioning that, estimate
 - 0 No. of inte-
 - 1] Dianeter of norzhe |
 - Flow rate
 - 145 No. of bushess

BTAK

1103

- Q21.01 What is a deall take? Why it is used in rowardou taking? Describe with tent, sketch the different types of early rate. [8]
 - 10 An issued flow meation turbing her overtill efficiency 20% and power output of 122 kW. The bend is the The speed at 230 mm and flow articles 0.85 and 0.85 mapsetively. The speed at 230 mm and hydrorid is efficiency is 0.8 Plant. [8]
 - It Angle of guide values
 - Want angle in mint.
 - 10 Burney discour-
 - b) Widthefminne at ister

Assume value up the facts to be contribut and displayers to be realist.

ŪΒ,

c) The stars discreter of soplar tarbane is det and inducionate in 2m. It works under not bend of 1 km and developed00000 kW. Guide vare angle is extensive edge of neuter is 35%. The hydratile and morall efficiency are 90% and 85% respectively. If were knows tarbane astheret which find wate angles at inlat and outlin of neuter lips add speed of tarbane. [8]

Q7) (i) How the model entiting of acatolingsi pump is made?	20

- 30 Write, shart holto (any two).
 - 0 Cavitation and their effects
 - M2SIL
 - in Multisaging of purp

030

- (1) A certrifugat pump definers 30 fit of water per sec to beight of 18 m through a pice 90m long and 100mm disrosler. It overall efficiency of pump is 75%. Find power reprint to attive the pump. Automa 19 0,012. [5]
 - (a) It is required to predict the performance of a large certrifugal pump from that of a scale model 1.4% the diameter. The model absorbs 1.5 kW when particing water ascient rest head of timus its base spead of 400 gets. The prototype pump is imported to pump against base of 30m. What will be its working speed, movements when the large pump to what will be the table of quantities discharged by the large pump to model.

÷.

Q40 m) Derive the expression for workdom put cycle by two stagered providing compression with perfect intercooling and discuss workdome in compression with run intercooling. 101

CR.

- Write sharp notes of any two.
 - 0 Industrial applications of coargonesial air
 - Derbre expression for volumetric efficiency of the Reciprocetting incorporation.
 - in Computation and working of root blows:

1101

- 53 Solve following two provisions.
 - A done stage compressor compressor or from 1 barris 34 bar and cellivers 2 at the logical pressure of a motival. The initial temperature is 15%. The low of compression in PV¹²⁵-Commut, and is the same for each stage. Assuming coordination of minimum weak, perfect interenating and that the offset of optimize classence and value resistance etc. May be reglected, find the power required to derive 14 m³ min minimum at the metion conditions. [3]
 - 4) A reciperating or compressor draws in 5 Kg of an per minute at 25% C. It compresses the 4E puly topically and delivers it or 105 %. Each fact power requires for compresses, if shall power in 14 KW. Find the Mechanical efficiency Accure R = 2871 Sphered at 13.51
- Q53 a) Describe briefly with a next story), the social flow compressor. Also define degree of reaction for so al flow compressor and draw the velocity diagram for 50 % degree of maction. [8]
 - b) A outary air compressive working between 2 and 4 for the laternal and external dimension of impeliar as 250 mm and 500 mm respectively. The three ough at inlet and order are 30° and 45° respectively. If fair all enters the impelier at 20 errors, Eing
 - Sport of the impellar in RPA.
 - Wark date by the completions per Kg of als.
 Old

-3-

184

SJ-323 Total Nu of Pages 13

Seal 3:2862

S.K. (Mechanical) (Part - II) (Semester - IV) (Revised) Examination, November - 2016 THEORY OF MACHINES - 1 Sub. Code: 63363

Day and Date : Thursday, 16-11-2016 Time : 2.30 jum. vol. 20 p.m.

Tetal Marks: 188

barradine.

- () Attemptall posities,
- 2) Figures to the clube indicate full resolution the question
- 3) Draw samial stud shrich whenever uscesses.
- It Around mitable data, if accession and state clourly,
- 2 Encourse programmable colculator is a larger.
- Q1) at Derive the condition for correct steering and explain any one steering gate mechanism satisfying this condition. [9]

OR.

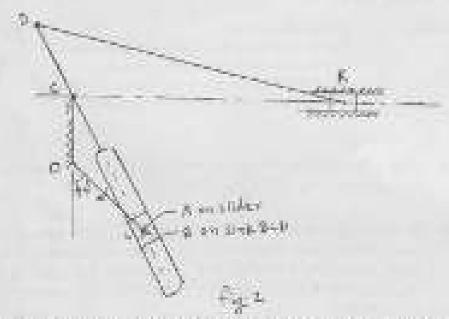
- a) A blooke's joint is and to content to a shafts. The driving shaft output it a uniform spool of 1000 apen. Determine the ground periodoible angle between the axis of chafts so that the total fluctuation of spool may relationshift 150 apen. Also first the recommendation interacts of driven that. [6]
- 0) The leasth of crark and concerning rod of an LC, origine mischanism in S0mm and 200 mm respectively. The count rotation at 200 cp.m. at shown in fig.1.6. So the given configuration, locate all the reductations centres and finds. [8]
 - elecity ufaliner a 15 and
 - its mighter velocity of AB



EIQ

\$1-323

- Q31 in a widtworth quick return resolution as shown in fig.2. OA is a cruric routing at 30 (percent in discussion direction. The directories of surious links area OA = 150 mm, OC = 100 mm, CO = 125 mm and DR = 500 mm, Determined [10]
 - 10 yeacity of slider R.
 - k) acceleration of slide: B and
 - (a) angular acceleration of slotted lever InCity.



Q(3) a) Derive the equation for friction around in cases of control pices bearing assymbly and/our wear with senal robustors. [8]

OR:

- a) Derive the equation for tangue required to fill the least by screw juck [8]-
- b) The thrase on propellar shaft of a matrice expline is taken up by 6 cellurs where commut and more all diameters 662 mmand 420 mm propertively. The threat pressure is 0.4 MN or and may be assumed uniform. The coefficient of friction between shaft and uniform is 0.04. If the shaft coulds at 90 c.p.m. find: 181

124

- total firmst on college-and.
- i) power fort in friction of the bearing.

861

()4(a) Explain classification of falseware with next garactes

111

For a resciliting follower and can system, pivor center is 36 mm above commuter and information length in 76 mm Reliber Softweer has reduce of 7 con and its center is above cars center Minimum reduce of rars as 70 mm. Motion of follower rars follows: [12]

Rise through 20° in 50° of carn rotation with SHM, Dwell for 90° of cars interview, 2 all in 90° of carn rotation with SHM. Draw the carn profile.

(05) () Explain Pronty Brake Dynamometer with near dorich.

[9]

$10R_{\odot}$

a) Derive Ste equation of mixer of increasions on Tagta and Statk Side (6)

b) A feather belt is required to transmit 9 kW from a pulling 120 cm is dometer, maning of 200 r.p.m. Through of ko is 365° and coefficient of theory between jestier belt and pullicy is 9.3. (The safe working stress in belt is 140 forces), over of best in 0.001 Kg/ers¹ and the thickness of bolt is 3 cm, doorming the width of the best taking the contributal term in account. [10]

Q6) at Explain working of contribugal governor, thrwit within from from the 1.561

QU.

a) Explain Effort and Power of Gevenior.

[6]

6) In apping Inded Hannell governor the segmental and vertical array of hell create lever are 40 mm and 80 mm respectively. The mass of each null is 3.2 kg. The extreme radiil of solution fails are 30 mm and 105 mm. The distance of the follower of each bill create lover is 25 mm from the association of the governor. The minimum optificium speed is 400 mm and maximum equilibrium speed is 4% higher than this. Datematic spring stifftens and lettial compression. [10]

SJ-324 Total No. of Pager 12

S.E. (Mechanical) (Revised) (Part-II) (Semester - IV	į,
Examination, November - 2016	27
MACHINE TOOLS AND PROCESSES	
Sub. Code (63364	

Day and Date + Friday, 11 - H - 2016 Time : 2,30 p.m. to 5,30 p.m.

Seat.

184

Total Marks (188)

Issraria	995.1 14 20 30 40	All Questions are complexesy Figures to the right indicates fail overlas Associate unitable data it necessory. Use of Pion-programmik actentific ententione	is allowed.
00 u	What or	e the steps involved in catal casting process?	State its
		un und limitations.	[5]
0990		e with neur skench elemonis of gating system. OR	18]
	Esphin	Centri light chatting process and state its appl.	unical M
Q2) 41	Give the With rea	sofficiation of soffing mill and expendency over	ype of rolling mill
- 80		direct curvation and indirect extrusion avec	[8]
8		.08	[8]
8	With nea	f sketch explain closed day longing process?	[8]
20. West	tauhietu	tole on (any tlabe)	1112
		- http://www.end	that
		n ferging.	

- e) three metiling.
- d). Genvity dist costing process:

P.T.O.

(240 m)	Calculate the geve train for cutting the 6 TPI point on work a lead screw of little is 4 TPI.	171
	The lathe is exposed with a change gear set from 20 to 126 test of 5 meth and an additional gear of 127 teeth.	
53	A lathe is provided with a change gene set from 20 to 120 set of 5 both over on additional gene of 127 steth. Find the gen muting include thread of # 25 min picth on a fatherhoving leads as 6 TPL	Sec. Sec.
e1	How is the failer greetified? Explain is detail attachment of pend on Julie?	10 turning [8]
	OR .	
-9	Describe with most sketch construction and working of verti- mentions.	ul boring M
Q5/ ii)	Draw block diagram of turnet brits and explain turnet index mp a in detail.	minutes [8]
<u>bi</u>	Describe with statich working of Universal milling mechine . OR	191
0)	Give the dotails of the varies and meaning and its sport fit purp or drifting machine.	vee used [%]
(26) Mil	In a shurt note pro-juny theory	(18)
10	Geor Rolling.	:1688
b]-	Librasonic mochining.	
- 63	Values operations performed on planning machine.	
	Ag Boring machine	

0 0 0

-3.5

er) lig Boring machine

SJ-325 Third No. of Pages 13

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P12.				

S.E.(Mechanical) (Pre-Revised) (Part-II) (Semester -IV) (Old) Examination, November - 2016 MACHINE TOOLS Sub. Code : 43595

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

Total Marks : 108

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Interactions : -	11.0	American	and thread	the same low of the	Same and	and the second second
	1996 B. B.	CONTRACTOR OF A	and the set	AND REPORT OF A 199	ALCONT COLD	LSCCIECTION.

- 1) Figures to the right indicates had marks.
- 3) Assente oritable data if pressury.
- 0 Use of Nen-programmable arientific makalator is allowed.

SECTION -1

Q12 41	 Uniw Dock diagram of larks. Name different parts and sta of each. 	re the function [8]
69	What are difficent methods of toper turning on label De any two methods.	narithe in brief [8]
QD(n)	Explain turret indexing mechanism with near deach.	[8]
6)	With next sketch describe crunk and slotted link quick retu- in shaper.	trr mechanismi [8]
Q25 a)	List various work holding devices used on drilling much any three in brief.	rite. Discribe [8]
b)	Classify planning machines and explain double beasing planting advects	nner sötti osat [8]
20 We	ite a strort note on (any duree)	2181
	Othegonal and oblique cutting.	
40	Table drive and fred mechanism in planar,	
- 4)	Horizottaj boring machine.	
db .	Jie boring machine.	

SECTION - II

<i>Q5</i> γ π) δ	Draw neat slotich of vertical milling attachment on percental m	# [8] illiog
	muchine and describe in brief.	193
Q(q, s)	Describe various standard accessories used for milling machine.	[8]
6	Describe geor durying process with next sketch.	[8]
27:0	State the specification of grinding wheels and explain the service used in i	1 181
b)	Explain construction of CNE machine with block diagram.	[8]
28) W	You short note on (Any Three)	[18]
4)	Sucfase grinder.	
- 60	Gear shaping.	
	CNC tooling	
d)	Classification of broaching muchines.	

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18 R #

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SL-308 Total No. of Pages : 4

Total Marks : 100

S.E. (Mechanical Engineering) (Semester-IV) Examination, April - 2017 APPLIED NUMERICAL METHODS Sub. Code : 63360

Day and Date : Tuesday, 25-04-2017 Time : 10.00 a.m. to 1.40 p.m.

Instructions: 17 A

Sent No.

- 1) All questions are compulsary.
- Make suitable assumptions/data if required and state clearly.
- Draw next skriches wherever accessory.
- 4) Figures to the right indicate full marks.
- 5) Use of calculator is allowed.

Q1) a) Solve any two

- Solve for a positive root of x-cosx+0 by Regula Falsi method.
- ii) Using-Newton Rapitson method field the mot between 0 and 1 of x'=6x-4.
- iii) Explain approximate error with an example.
- b) Perform two iterations of the Newton Raphson method to solve the system of equations

x²+xy=10; y=3xy²=57

Take initial approximations as x₂=1.8, y₂=3.1.

Q2) Solve any three

 The currents i₁, i₂, i₃, and i₄ in an electric network satisfy the system of linear equation

$$3i_1+2i_2-i_3=60$$

 $2i_3-i_3+4i_3=160$
 $4i_3+i_2-2i_4=29$

S.-i,-2, fi,-0

Using Gauss Jordan method, find i. i., i., and i.,

M-SDG



[2×5-10]

[10]

3×5-151

SL-308

59

345-151

b) Solve the following equations by Gauss-Seidal method.

83x+11y-4z+95

3x180+202-71

7x+52y+13z=104

c) C Solve the system of equations using LU Decomposition

Sti-2y+z-4

78-1-52-8

3x+7y+4z=10

Solve the system of equations using Gauss Elimination method $d\Sigma$ x+2;+z=3

28139132=10

3x-y+2x-13

Q3) Solve any three, [1]

From the table given below, find the best values of 'a' and to fire curve 131

y-sizh by the method of least squarzs.

80 31 4 351.65 2.7° F 14.5 7.35

Using Lagrange's formula of interpolation find y(0.5). 63

30	7	8	9	10
32	3	1	1	9

c) Findf(x) as a polynomial in x and hence f(0) for the following data by Newton's divided difference formula.

34		1	-2	3
((x):	-28	15	12	3

d) Define Independent, repeated, Bernoulli trials and hence explain binomial distribution with an example. SUN ST

SL-308 13×5=151

O4) Solve my three.

Given the data below, find the isothermal work done on the gas as it is 6Ncompressed from 23 litres to 3 litres. $W=\int_{0}^{10} pdv$ using Simpsons 1/3⁴⁴ Rule.

V (litte	3	. 8	13	18	25
P (atm):	12.5	3.5	1.8	1.4	1.2

- Use Romberg's method to evaluate [(dx/(x*x+4)) take h=1.0.0.5,and 160.25.
- Evaluate ["1 (sins)ds by two point Gaussian Quodinture formula. C_{1}
- The table given below reveals the velocity 'v' of a body during the time dY_{i} "t". Find its seccloration at t=1.1.

1	1.0	4.4	1.2	1.3	1.4
¥.	43.1	47.7	52.1	36,4	60.8

Q5) Solve any three.

- bising modified Eulers method find y at x=1.5 if y'=2y/x Given y(1)=2 - 21 take h=0.25
- b) Find the eigen values and corresponding eigen vectors of
 - $\begin{bmatrix} 5 & 0 & 1 \\ 0 & -2 & 0 \\ 1 & 0 & 5 \end{bmatrix}$ by both power method

c) Given the boundary value problem $\frac{d^2y}{dx^2} = ex^2$; y(0)=2, y(1)=5 obtain its solution in the range $0 \le x \le 1$ with h=0.25 using finite difference method.

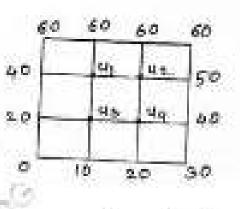
d) Solve $\frac{dy}{dx} = y - x^2$; given y(0)=1 by picard; method. Obtain the values of y(0,1), y(0,2).

Q6) a) Classify the following partial differential equations:

- 0 U_{x0}+4U_{xy}+4U_{yy}=0
- $0 = x^2 O_{yy} + (1-y^2) O_{yy} = 0; x > 0, y > 0$
- ii) $y^{2}U_{xx}+U_{y}=0$

504-505

- b) Explain implicit method with a neat sketch.
- c) Solve U_{xx}+U_{xx}=0 in the square region as shown in fig.1 by Liebmann's method. Take Δx-Δy. Perform three iterations of Gauss Seidal method.





SK-5012

1101

SUMERIE

SUMSOO

[S]

SL-308

SL-309 Total No. of Pages : 3

S.E. (Mech.) (Part-II) (Revised) (Semester-IV) Examination, April - 2017 ANALYSIS OF MECHANICAL ELEMENTS Sub. Code : 63361

Day and Date : Thursday, 27-64-2017 Time : 10.00 a.m. to 1.00 p.m.

Sent.

No.

Total Marks : 100

Instructions: 1) Attemptall questions.

- Figures to the right indicate full souries.
- 3) Draw near and labeled sketches wherever necessary.
- 4) Assume auttable data, if necessary and state it clearly.
- 5) Use of asse-programmable colculator is allowed.
- Q1) a) Two brass rods and one steel rod together support a load as shown in Fig.1. If the stresses in brass and steel are not to exceed 60N/mm² and 120N/mm², find the safe load that can be supported. Take E for steel=2×10%/mm² and E for Brass+1×10⁶N/mm². The cross sectional area of steel rod is 1500mm² and of each brass rod is 1000mm³. [12]

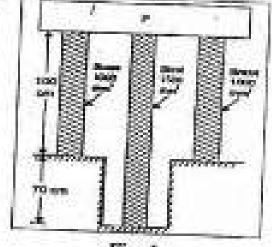


Fig. 1

Explain the concept of thermal stresses giving the equations.

[6]

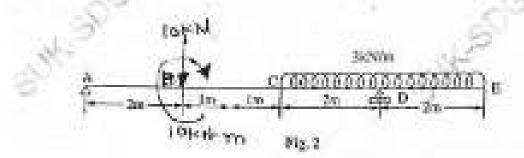
ÖR.

b) A bollow shaft having an inside diameter 60% of its outer diameter, is to replace a solid shaft transmitting the same power at the same speed. Calculate the percentage saving in the material, if the material to be used is also the same. [6]

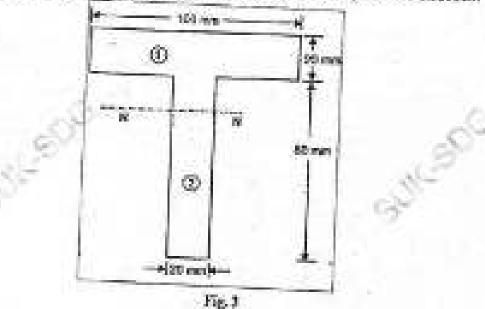
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SL-309

Q2) Draw SFD and BMD for the loading condition shown in Fig.2. Locate the point of inflection if any. [16]



Q3) A cast iron beam is of T-section as shown in Fig.3. The beam is simply supported on a span of 8m. The beam carries an UDL of 1.5kN/m on the entire span. Determine the maximum tensile and compressive stresses. [16]



- (Q4) a) Derive an expression for normal stress and tangential stress when a member subjected to like direct stresses in two mutually perpendicular directions. [8]
 - b) At a point in a strained material the principal stresses are 100N/mm³ (tensile) and 60N/mm³ (compressive). Determine the normal stress, shear stress and the resultant stress on a plane inclined at 40° with the major principal plane. Determine also the obliquity.

OR

 $\cdot 2 \cdot \cdot$

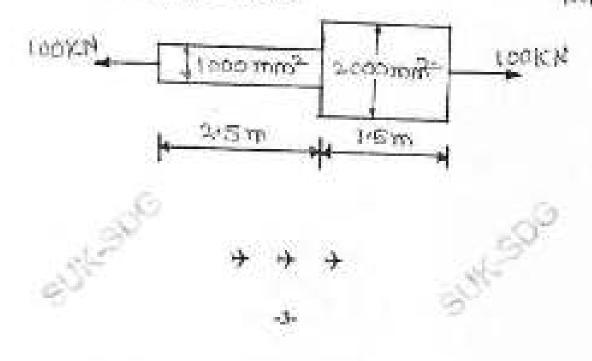
SL-309

16]

- b) If the cross-section of beam is symmetrical I section about y axis with following dimensions. Top flange: 300mm×20mm, Web: 15mm×300mm, Bottom flange: 200mm×20mm. Maximum shear force on the section is 202KN. Calculate the shear stresses across the section and represent graphically. Take M.I about N.A.I=283.01×10⁹mm⁴. [10]
- Q5) a) Derive an expression for slops and deflection of z slopply supported beam of length L, carrying UDL throughout the beam. Use double integration method. [9]
 - b) A cantilever of length 3m is carrying a point load of 25KN at the free end. If the moment of inertia of the beam=105mm² and value of B=2.1×10⁵N/mm³, find slope of the cantilever at the free end and deflection at the free end. [8]

OR:

- List the different theories of elastic failure and explain maximum strain energy theory.
 [8]
- Q6) a) Derive Rabking formula of a backling load.
 - b) A tension test har 4m loog is made up of two parts, one 2.5m long has a cross section area of 1000mm² and another 1.5m long having cross sectional area of 2000mm². If an axial load of 100KN is gradually applied. Find the total strain energy produced in the har and compare it with the strain energy for a uniform bar of same length and same volume under same load. Assume E=200GPa. [10]



SL-310 Tetal Na of Pages of

S.E. (Mech.) (Part - II) (Semester - IV) Examination, April - 2017 FLUID AND TURBO MACHINERY Sub. Code : 63362

Day and Date 1 Saturday,29-04-2017 Time 1 19:40 a.m. to 1.30 p.m.

Total Marks (10)

Instructions (1) All questions are compaliary.

Seat.

Na.,

- 2) Figures to the right indicate full marks,
- 3) Assume sutrable data if nicesings.
- Use of non-programmable calculator is allowed.

Q1) a) What is turbo machine? How somer turbing are classified.

181

b) A Pelton wheel works under a gross head of 500m one third of which is lost in friction in purstock. The rate of flow is 2 m³/a. The jet is deflected through an angle of 165°. Determine the power developed and the hydroutic efficiency of the turbine. Take speed ratio as 0.45 and C, as 0.98.

OR:

a) A three jet Polton turbing is required to generate 10000 kW of power under not head of 400 m. The blode angle at outlet is 15° and reduction in relative velocity while passing over blade is 5%. If overall efficiency is 80%, C_i= 0.98 and speed ratio = 0.46 find [8]

0 Diameter of jeg.

i) Total flow in n2/see

Found exerted by jet on buckets.

RTO

Q2) a) Give the important relations of Francis turbine.

b) A reaction turbine is supplied with 100 mbace of water under head of 150m. The runner diameter is 3 from at inlet and 2.4 m at outjet, it's inlet vate angle is 120° and discharge is cadial at 15m/s. Assuming breadth of wheel to remain constant and hydraulic efficiency 90%: Find power Coveloped and speed of the turbine. (3)

OR.

- and 2250 mm respectively. The velocity of flow at outlet of don't table is 2m/sec. The length of draft table is 6m out of which 1m is submerged in the tail water. The stroopheric pressure at tail race level is 10m of water. Loss of head due to friction and other causes is 0.25 times the velocity head at outlet of draft table. Find pressure head at inlet of table and efficiency of draft table.
- Q3) a) What is pump? Define the terms, delivery head, static head and manometric head. [8]
 - b) Write short-notes (any two),

Working of single stage centrifugal pump.

B Efficiencies of centrifugal pumps.

ii) Performance curves for pumps.

OR:

c) i) A single stage contributed pump with impeller diameter of 30 cm rotates at 2000 rpm and lifts 3m³/sec of water to a height of 30 m with an efficiency of 75%. Find the number of stages and diameter of each impeller of a similar multistage pump to lift 5m³/sec of water to a height of 200 meters when rotating at 1500 rpm. [5]

ii) The internal and external diameter of the impeller of centrifugal pump are 200mm and 400mm respectively. The pump is running at 1200 type. The vare angles of the impeller at infet and outlet are 20⁶ and 30⁶ empectively. The water enters the impellor radially and solocity of flow is constant. Determine the work done by the impeller per unit weight of water. [5]

SL-310

34-50

[10]

SL-310

046.61

Prove that minimum work input in two stage reciproceting compressor is required when the optimum interroediate pressure is SUHSOG

E.o., RE

White

- P, is inlet pressure in low pressure cylinder
- P, is intermediate pressure
- P, is outlet pressure in high pressure cylinder.
- Write abort notes on any two. 66

Construction of Rost blower and Vane blower. 86

- Difference between reciprocating compressor and rotary aumpressor.
- Different afficiencies of reciprocating compressor. 「根に、

OR:

- Find the percentage saving in work by comparing air in two stoges 53. from 1 bar to 7 bar instead of one stage. Assume odmoression "index 1.35 in both the cases and optimum pressure and complete intercooling in two state compressor. 153
 - A single stage reciprocating compressor takes in 7.5 mWmin of sir 30 at 1 bar 80°C and delivers it at 5 ber. The elegrance is 5% of the stroke. The expansion and compression index is 1.3. Calculate volumetric efficiency of compressor. [5]
- Q5) a) Explain the losses and isentropic efficiency in centrifugal compressors [8]
 - A centrifugal compressor delivery 16.5 kg/s of air with a total head 357. prossure ratio 4:1. The speed at the compressor is 15000 rpm. Inlet total head temperature is 20°C, slip factor 0.9, Power loput factor 1.04 and isentropic efficiency 30%. Calculate 357

SUKSDO

- Overall diameter of the impellint. Ď
- Poster Input (Assume C, = 1.003 kJ/kgK) OR :

 -3π

[10]

- b) Determine
 - ii Velocity of flaw.
 - Number of stages for an axial flow environment.

When compressor has compression ratio as 8, draws air at 293 K delivern it it \$23 K and rotates with blade velocity 180 m/sec. The mean blade speed and velocity are the constant throughout the compressor.

Take Work factor is 0.87, $\alpha_1 = 15^{\circ}$, $\beta_2 = 40^{\circ}$, $C_p = 1.005$ kB/kgK. Assume degree of reaction is 50%

- (Q6) a) Explain working of closed cycle Gas Turbine along with P-V diagram. Also explain why the actual Brayton cycle differs from ideal cycle. [8]
 - b) The gas turbine unit operating on air standard cycle in which the air enters the compressor at 1.0 bar and 20°C. The pressure of air leaving the compressor is 3.5 bar and the temperature at terbine inlet is 600°C. Determine perkg of air: (8)
 - i) Efficiency of the cycle.
 - 1) Heat supplied to ain.

in the

- 10 Work available at the shaft.
- iv) Heat rejected in the cooler, and
- (9) Temperature of air leaving the tarbins. For sir y = 1.4 and C = 1.005 kJ/kg K.

OR.

b) In this inclusion, the isentropic efficiency of the compressor and turbine are 0.90. A turbine unit has a pressure ratio 5:1 and maximum cycle temperature of \$80°C. Calculate the workdows by turbine, compressor work input and total work when the air enters the compressor at 15°C at the rate of 15 kg/s.

Take $C_{\gamma} = 1.005$ kD/kgK and $\gamma = 1.4$ for the compression and $C_{\gamma} = 1.11$ kD/ kgK and $\gamma = 1.35$ for the expansion. (8)

ENVESO



SL-311 Total No. of Pages : 3

Seat No.

S.E. (Mechanical) (Part-II) (Semester-IV) (Revised) Examination, May - 2017 THEORY OF MACHINES-I Sub, Code : 63363

Day and Date ; Wednesday, 3-05-2017 Time : 9:09 a.m. to 1:00 p.m.

Total Marks : 190

PTO:

Instructions:

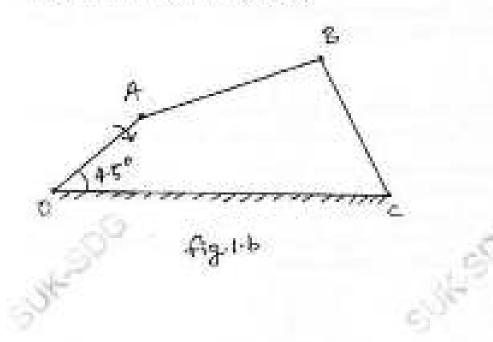
- 1) All questions are compulsory.
- 1) Figures to the right indicate full marks to the question.
- b) Drave near labeled sketch relevence necessary.
- 4) Assume suitable dam, if necessary and state clearly.
- 5) Use of non-programmable calculator is allowed.

Q1) a) Explain the inversions of single-slider crack chain with next sketches.[8]

OR.

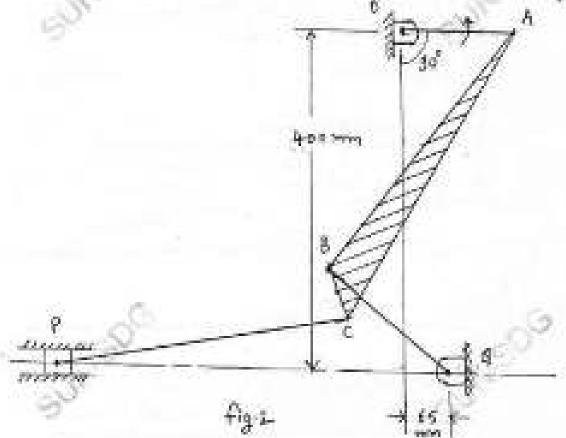
Explain different types of kinematic pairs with the help of near aketiches.
 [8]

 A four-bar mechanism is aboven in fig. l.b. Crank QA rotates at 250 nip.m. Lengths of various links are: OA=250mm, AB=400 mm, BC=350 mm and OC=700 mm. Locate all the instantaneous centres and fied the angular velocities of links AB and BC.



SL-311

Q2) Crank OA of the mechanism shown in fig.2 rotates uniformly at 150 r.p.m. The dimensions of the various links are: OA=150 mm, AB=375 mm, AC=400 mm, BC=65 mm, BQ=200 mm, CE=400 mm. For the given configuration, find: (i) velocity of piston P, (ii) acceleration of piston P and (iii)ingular acceleration of link ABC.



 Q3) a) Derive the equation for friction torque in case of flat pivot bearing assuming uniform wear condition.
 [8]

OR.

- a) Derive the equation for friction torque in case of conical pivot bearing assuming uniform pressure with usual notations. [8]
- b) A truncated conical pivot supports a load of 20 kN and has angle of cone equal to 120°. The external radius is twice the internal radius. The shuft is rotating at 100 spon. The intensity of pressure is equal to 0.3 MN/m³. The coefficient of friction is 0.04. Determine the power tast in friction assuming uniform wear. [8]

SL-311

- Q4) a) Draw Displacement, Velocity and Acceleration diagram for follower moving with cycloidal motion. Also write equations of Maximum velocity and acceleration of follower. [6]
 - b) A case optiming at uniform speed of 1000 rpm is recuired to give following motion;
 - Follower to move outwards through 50 mm charing (120*)
 - Follower to dwell for next 60° of cam rotation."
 - Follower return to its starting position during next 90° of campotation.
 - Follower to dwall for rest of cars rotation.

The minimum radius of cars is 50 mm and the diameter of roller is 12 mm. The line of stroke of the follower is off-set by 20 mm from the axis of cars shaft. If the displacement of the follower takes place with uniform acceleration and retardation for both the outward and return stroke, draw the profile of the cars. [12]

Q5) 4) Explain what is Dynamometer. What are different types of dynamometer? Explain any one in detail. [6]

ΘR

- Explain initial tension and Centrifugal tension in belt,
 [6]
- b) A shaft running at 90 r.p.m. is to drive another shaft at 225 r.p.m. and transmit 10.3 kW. The belt is 115 mm wide and 12 mm thick and coefficient of friction between belt and pulley is 0.25. The distance between the shafts is 2.75 m and the smaller pulley is 600 mm in diameter. Calculate the stress in an open helt connecting the two pulleys. [10]
- Q6) a) Explain controlling force curve for Governor.

-[6]

OR.

- What is sensitiveness? Discuss the effect of friction at sleeve on the performance of a Governor.
- b) The mass of each hall of a Harmell governor is 1.4 kg. The length of weight ann and sleeve arm are 100 mm and 50 mm respectively. The distance of fulcrum of bell crank lover from the axis of rotation is 80 mm. The extreme radii of rotation of balls are 75 mm and 112.5 mm. The maximum equilibrium speed is 6% greater than minimum equilibrium speed which is 300 rpm. Determine stiffness of spring. Ifr radius of rotation of halls is 90mm what will be the equilibrium speed? [10]

S.E	Mes	banica) (Part-II) (Semeste	r-IV) (Revise	che
	1.0	Ex	amination, May - 20	17 5	
	M.	ACHINI	TOOLS AND PRO	CESSES	
	2		Sub. Code: 63364	100	
nud 6 : H	Date : Fr 1.00 a.m.	iday, 05-05 to 1.00 p.m	-2017	Total Mar	los : 105
uctio	asi 1) 2) 3) 6)	Figures n Assume s	ions are compolitory. 6 the right indicate full number aitable data, if necessary. 9 programmable Scientific Cal	rulator is allowed.	
4	State an	d explain t	he properties of molding sur	ıd.	[8]
b) -	Explain	with near	sketch a suitable furnace u	tied for meltion /	of most-
	ferrous:	metals.	100000	and the second of	185
		37	OR		30
6)	Explain	investment	casting process and state its	envications	181
1	35				100
6 T	List the y	arious rese	al forming processes and au	to the second	
	working	over cold	working of metals.	we are any managers	[8]
9	Compare	ropes die	forging process and closed	die foming proce	181.181
			OR		on 194
ğ (Indicate	by means	of a line diagram and exp	ale differenti etc.	1992
1	macrofice	ure of stee	situet, starting from steel in	gots.	ges in [8]
Vrihe	a short t	inte on (A:	(y Three)		{18]
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1	nduction	furnece		122	
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SL-312 Total No. of Pages : 2

Day and Date : Frid Time : 10.00 a.m. to

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No.

Instructions :

- 21
- 25
- 45
- Q1) a) State and
 - b) Explain y E nonferrous m [8]

- Q23-23 List the va ofhot working o - [8]
 - $\{0\}$ Compare 4 8. [8]
 - $\{0\}$ Indicate In es in manufactor 185

Q3] Write a short no

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- 63 Defects infl
- cInjection in
- dInduction fi



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[8]

189

Q4) a) Calculate the gear train for cutting the 5 TPI pitch on work piece if the lead screw of latite is 4 TPI. The lathe is supplied with a change gear set from 20 to 120 teeth in steps of 5 telebrand an additional gear of 127 teeth. [3]

- b) A lattice is provided with a change gear set from 20 to 120 teeth in stops of 5 teeth and an additional gear of 127 teeth. Find the gear train for during meetic thread of 3 mm pitch on a lathe having lead screw pitch as 6 TPL. [5]
- c) Explain various accesaries used on lather

ØR.

- c) Describe with next aketch construction & working of horizontal boring mechine.
 [8]
- Q5) s) Explain her feeding mechanism on a capstan lathe.
 - b) Describe with next skotch vertical milling attachment for horizontal milling. [2] [8]

OR:

 With next sketch mightin construction and working of radial cirilling thachine.

Q6) Write a short note on (Any Three).

- a) Gear Shaving
- b) Laser Beam machining
- c) Various operations performed on shaping machine
- d) Turret indexing mechanism

SUKSO

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[18]

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SL-356 Tenal No. of Pages : 2

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Sec.		- 01
Sec. 21		
1993 A.		- 19 M

S.E. (Mechanical) (Pre-revised) (Part-II) (Semester-IV) (Old) Examination, May-2017 MACHINE TOOLS Sub, Code : 43595

Day and Date : Monday, 22-05-2017 Time : 10.00 u.m. to 1.00 p.m. Total Marks : 180

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Instructions :	1.1.1	A DESCRIPTION OF THE REAL	The second state of the second	from each section.
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- 2) Figures to the eight indicate fall marks.
- Assume suitable data if necessary.
- 4) Use of Non-programmable Scientific Calculator is allowed.

SECTION-I

Q11 (i)	What are principal parts of laths? State the function of each,	181
69	Describe with next sketch any two methods of taper turning on h	uine/[8]
Q2) iii	State and explain various operations performed on drilling much	ine? [8]
b)	Explain construction and working of shaping machine?	[8]
Q3) a)	With the help of neat sketch explain Crank and slottest link quiet	k return.
	mechanisen in shaper.	[8]
(b)	List the classification of planer? Explain any one with black disp	ram.[8]

(Q4) Write a short note on (any three)

- a) Visious attachments used on lather
- b) Bar feeding mechanism.
- c) fighteing-machine.
- d) Classification of machine tools.

ETO.

118

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[18]

SECTION-II

Q5) #)	Describe the main features of the following milling machines	181
1012162	Plain milling muchine	
	ii) Vertical Milling Machine	
	iii) Universal milling muching	
\mathbf{h}	What we the various jub bolifing devices used on mitting machine.	[8]
Q6) a)	Explain BIS marking system of grinding wheels.	183
b)	How see the granding machine classified? Describe any one in detail	[8]
Q7)-a)	Liss Gear manufacturing processes. Explain gear hobbing process.	[8]
bj	Draw a next sketch of an internal breaching tool and describe its var elements.	ious [8]

 2^{2}

(08) Write a short note on (any flute).

- a) Tool and catter grinder.
- b) Accessories used on unilling machine.
- e] Gear burnishing.
- d) Types of CNC monhines.

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Tetal Nu. of Pages : 4

B.Sc., B.Sc. (Biotech), B.Sc. (Sugar Tech.), B.Sc. (I.T.), B.Sc. (Animation Science), B.Sc. (Forensic Science), B.Sc. (Food Processing), B.C.A., B.B.A., Law, B. Tech., B.Sc. (Nano Science), B.I.D., B.F.T.M.,B. Desh., B.D.F.C., B.C.S., B.Form, S.E.,B. Architecture, B. Textiles, B.M.M.,B.Voc. (All Degree) (Semester - IV) Examination, May - 2018 ENVIRONMENTAL STUDIES (New) (Compulsory) Duy and Date (Sunday, 20+05 - 2018 Sub . Code : 6 7185 Total Marks : 70 Time : 11.09 n.m. to 02.00 p.m. All questions are compulsary. Tellmarfilens: 133-15 Figures to the right indicate full marks. QD. Select correct answer from the given alternatives. 1668 Otoric in the otoocollette is present in the layer. 86 Stratogenere. bi-Transportants. a) Thermosphere. 63 Inosphere. Mahamahma has large mineral deposits of (B) Mice b/clines. ei Baueire ÷. Gold H) Pollowing is a man-made disaster. Rain 脸 Cycline ey Mutlearlissord dSBritcht [8] Environmental day is relebrated on 45 August (3) 22 April 1 16 September dy. Air pollution (preventation and control) Act in India was anapted in the 1022. ŵ. 1972hit 15900 19380 631 GI. 1581 vi) Following is Fry-sith biodiversity conservation method. 10 National Fark bSeed hank Bioschim reserve 20.02 None of the above. 韵 vii) Following Is non-renewable resource. Weat 10. 16.1 Water Southt 03.3Problem:

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viii) Fallowing gas is responsible for noid cain.

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a) Here	- 60E	Dynes
c) Joules	d) -	Decibel
The disposing method for biom	oditet v	1052-10

- a) incinguition 10 bit was
 - b) Vernicompositing
 - c) Landfiling
- dy Compositing

(27) Answer any three of the following

- a) What are various method for controlling the growing population in nur country?
- b) Define fixed chain. Explain the types of fixed chain with suitable examples.
- Give an account of consumerian in relation to environment.
- d) Give disaster management of carthquaster.
- d) Discuss the courses of deforestation.

Q2) Write shert notes on any three.

Mining

201

22

5) Waterprillation

<) In-situation

- d) Giolal Warming
- iumanrigin
- 2 Environmental Ethics
- Q40 Discuss the concept and importances of environmental studies related to public awareness. [10]

OR.

What are national resources? Give the type of natural resources. Discuss fainst as a resource.

Q5) Give formation and environmental impact of seld min and Ouose depiction.[10] OR

Give solient features or wildlife protection Act of Initia.

Q60 What noe the steps taken for water conservation. Discuss rate water harvesting techniques.

08

Explain the concept of acceptant & discuss enemy flow in 10%

H-SED REPLIES

13.51

मरादी रूपांतर

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- 31 MINUT
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- (4) नुसरकार्ग सब्देव
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- हो। समयी इत्रज्ञ
- 93 पर्वतालेस सित्रमुग्दे

film

र्वेस्टीक स्वाधकांकली करनावे बाग्य ? वैस्ट्रीज स्वाधनरंपलीचे प्रबता गर्मता. प्रेरत तुक अंतराव प्राप्त कार्य.

9.5) अपलप्तवंग्र न प्रदेशीय प्रयापी विश्वित व त्याचे प्रयोगस्तीय तुम्दनियाम सांगः. [14] विश्व

मस्त्रामील कर जीव संवर्धन स्वयद्ध्यतीय प्रमुख अनुवे सांगा.

प्र.६) जलसंधर्धनचे त्रयथ कोमले? सलसाठा प्रवयचे संबद्धा स्वयपार्थ प्राइवे सह करा [10] हिंदा

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वींगांग्लेची संबद्धपरा सरहे करत त्यालेल इज्लंबहुरावित्रयी धर्च छत्.

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Total Nu. of Pages 13

S.E. (Mechanical Engineering) (Semester - IV) Examination, May - 2018 APPLIED NUMERICAL METHODS Sub, Code : 63360

Day and Date : Feiday, 04 - 05 - 2015 Time : 10.09 a.m. to 1.00 p.m. Total Marks : 160

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Seat. No.

- 1) All questions are compulsory.
- Make soitable assumptions duta if required and state elearty.
- Draw next sketches wherever necessary.
- 4) Figures to the right indicate full marks.
- 5) Use of calculator is allowed.

Q1) a) Explain the different types of errors in numerical computations. [4].

b) Solve any two t

 Use bisoction method to find the root correct to three decimal places of f(x)-x²-4x-8.95-0.

- Ilaing Newton's iterative method, find the real root of glog ar=1.2 correct to five decimal places.
- III) Use Muller's method to find a root of the equation x'-3x-7=0, which lies between 2 and 3.

Q2) Solve any two :

 $[2 \times 8 = 16]$

12×6=121

a) Solve the following equations by Grass-Jordan method

3x+4p+5z=18 2x-c+8z=13

52-1172-20

h) Solve the system of equations using LU Decomposition.

3x+2y+7z=4 2x+3y+z=5

3++4p1=-7

P.F.O.

SV-78

 solve the following equations by Gauss-Jacobi method, 15x+3y-2r+85
 2x+10y+r=51

x-20+8e-5

Q3) a) Fit a polynomial of the second degree for the following data: [6]

x; 0 1 2 3 4 y; 1 0 3 10 21

Hence find y at a=2.5

 Derive the equation of the inserpolating polynomial by Newton's divided difference table for the following data: [6]

x: 0 1 2 3 4 5 y: 3 2 7 24 59 118

c) Colculate the mean and standard deviation for the following data: [6]

Size-of item: 6 7 8 9 10 11 12 Prequency: 3 6 9 13 8 5 4

Q4) Solve may town :

- [2×8=16]
- a) A slider in a machine moves along a fixed straight rod. Its distance x(w) along the rod are given in the table for various values of time (sec). Find the velocity and acceleration of slider at 1/0.3 seconds.

(1000)	0	0.1	0.2	0.3	0.4	0.5	0.6
x(m).	30.13	31.62	32.87	33.64	33.95	33,81	33.24

- Evaluate [litest using traperoidal and Simpson's 1/3rd rule res6.
- Case Romberg's method to enshate [sin ndy.

Q5) Solve any two ;

a) Compute y(0,2) excret to four decimal places, for $\frac{dy}{dx} = y + xy^2 = 0$ with y(0)=1, take h=0,1. Use RangeKotta fourth order method.

SV-78

161

 $12 \times 8 - 161$

- b) Given the boundary value problem $\frac{d^2y}{dx^2} = 6x + 4y(0)=2, y(1)=3$ obtain its solution in the range 062631 with b=0.25 using Finite Difference method.
- c) Solve the equation \$\frac{s0}{de} = x + \mathcal{T}\$. Given \$\mathcal{y}(0)=1\$. Obtain the values of \$\mathcal{y}(0,1)\$, \$\mathcal{y}(0,2)\$ using Picard's method.
- Q6) (i) Classify the following partial differential equations :
 - $1) \quad \frac{\partial^2 y}{\partial t^2} = \alpha^2 \frac{\partial^2 y}{\partial x^2}$
 - ii) $xU_{\alpha} + yU_{\alpha} + 4y^2U_{\alpha} = 0$
 - $iii) \quad \frac{\partial u}{\partial t} = k \frac{\partial^2 u}{\partial t^2}$
 - Solve U_{at} + U_{ja} = 0 in the square mesh of side 4 units satisfying the following conditions. [12]
 - $\hat{y} = y(\hat{y}_{ij}) = 0$ for 05) 54.
 - i) u(4y) = 124y for 0.5yS4
 - ii) u(x,0) = 3x for 05x54
 - iv) $u(x, 4) = x^2$ for $0 \le \le 4$

Perform two iterations

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-36

SV - 79 Total No. of Pages : 4

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S.E. (Mechanical) (Semester - IV) Examination, May - 2018 ANALYSIS OF MECHANICAL ELEMENTS

Sub. Code: 63361

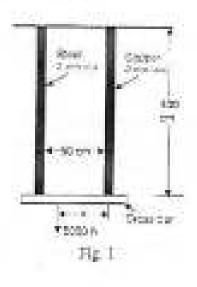
Day and Date : Monday, 07+05-2018 Time :10.00 a.m. to 1.00 p.m.

Total Marks : 100

Instructions :

ist.Pr

- 1) All questions are compalsory.
- Assume suitable data wherever necessary and state it clearly.
- 5) Figures to the right indicate full marks.
- 4) Draw man and labeled sketches wherever necessary.
- 5) Use of van programmable calculator is alleved.
- Q1) a) Two vertical ends one of start and the other of copper see each rigidly fixed at the top and 50 em apart as shown in Fig. 1. Diameters and lengths of each red are 2 cm and 6 m respectively. A cross a bar fixed to the rods of the lower ends carries a load of 5000 N such that the cross bar ternains horizontal even after loading. Find the stress in each red and the position of the load on the bar. Take E for steel ~2 × 10⁴ N/mm² and E for copper 1 × 10⁵ N/mm².



P.T.O.

b) Explain the stress strain curve for ductile and brittle material with the help of next sketch. [6]

SV - 79

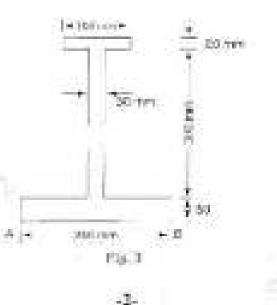
OR.

- b) Find the angle of twist per meter length of hollow shaft of 100 mm external and 60 mm internal diameter. If the shear stress is not to exceed 35 N/mm². Take modulus of rigidity as 85 × 10^o N/mm².
- Q2) Draw SFD and BMD for loading condition shown in fig 2. Locate point of inflection if any. [16]





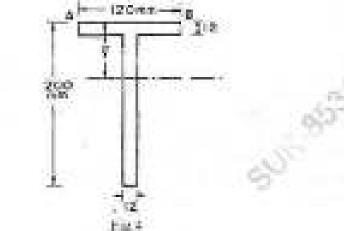
Q3) The tension flange of a cust iron I section beam is 240 mm wide and 50 mm deep, the compression flange is 100 mm wide and 20 mm deep whereas web is 206 mm × 30 mm as shown in fig. 3. Find the load per meter run which can be carried over a 4m span by a simply supported beam, if the maximum permissible stresses are 90 N/mm³ in compression and 24 N/mm³ in tension. [16]



- Q4) 1) Derive the expression for the principal stresses and the maximum shear stress for a member subjected to like direct stresses in mutually prependicular directions. Show the locations of Principal Planes and Planes of Maximum shear stress. [9]
 - (b) The stresses on the two perpendicular planes through a point are 120 MPa (trassile), 80 MPa (Compressive), 60 MPa (Shear). Determine the nomini and shear stress components on a plane at 60° to that of the 120 MPa stress and also the resultant and its inclination with normal components on the plane. [9]

OR.

b) The cross section of a beam is T section 120mm × 200mm × 12mm Fig. 4 with 120mm side horizontal. Sketch the shear stress distribution and hence find the maximum shear stress if it has to resist a shear force of 200 kN. [9]



- (Q5) a) Derive the expression for slope and deflection of a cantilever subjected to uniformly distributed load (UDL) over whole length using double integration method. [8]
 - b) A cantilever beam of spin 4 m carries a point load of 20 kN at a distance of 3 m from the fixed end. Determine, by moment area method the slope and deflection at the free end of the cuntilever Assume EI = 2×10¹² N mm². [8]

OR.

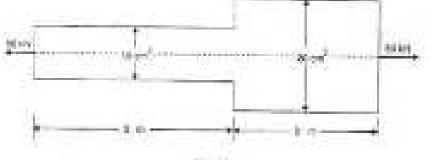
State the importance of theories of failure and explain the maximum strain energy theory. [8]

253

11-20ah

[8]

- Explain the concept of Equivalent Length and alendemess ratio of the O(6) (a) column. Discuss the limitation of the Euler's Formula-
 - A tension for 5 m long (Fig. 5) is made up of two parts, 5m of its 63 length has a cross sectional area of 10 cm² while the remaining 2 m has an cross sectional area of 20 cm³. An axial load of 80 kN is gradually applied. Find the total strain energy produced in the bar of the same length and having the same vocume when order the same load. Take $E = 2 \times 10^5 N^3 mm^2$. 181



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S.E. (Mechanical Engineering) (Semuster - IV) Examination, May - 2019 APPLIED NUMERICAL METHODS

Sub. Code: 63360

Day and Date : Teesday, 14 - 08 - 2019 Time : 2.30 p.m. to 5.30 p.m.

Total Marks : 100

- Instructions: All mention are compelsory. \mathbf{D}^{*}
 - Make subside annangeloon/date it required acclarate clearly. 31.
 - Brave near skotchra wherever an energy, 29
 - Figures to the right indicate full marine. 編.
 - Use of calculator is allowed. 231

Q11 a) Explain accuracy and precision with help of near observi-

b) Solve my pap

[246-12]

143

- Use faise position method to find the root correct to three dectual ы. claces of $f(\mathcal{X}) = x^2 = 4x + 1 = 0$.
- ii) Using Newman's iterative method, find the real root of $x^2 = 6e 4$ which lies between 0 and 1 convect to five decised places.
- II) Use Moller's method to find a root the equation $x^{1} \rightarrow 7x^{2} + 6x + 5 = 0$. using $X_{i} = 0; X_{i} = 1; X_{i} = 2$.

(Q2) Solve any two

 Solve the following equations by Gross-Jordon method. 12:8-161

ボナチティスロリ 3x-31 | 4z=13 30142+51=40

ET.O.

SV-80

b) Solve the system of equations using LU Decomposition.

5x - 2y + z = 4 7x - y - 5z = 83x + 7y + 4z = 10

c) Solve the following equations by Grass-Jacobi method.

27x + 6y - x = 85x + y + 54z - 1106x + 13y + 2z = 72

Q3) 4) An experiment on the life of cutting sool at different cutting speeds are [6] given below: [6] Speed v: 350 400 500 500 Life T(min): 61 26 7 2.6

Fit a relation of the form $v = x P_{v}$

 Find the value of y at x=G from the following data using Lagrange's interpolation formula.
 [6]

x 0 1 2 4 y 1 3 9 8i

c) Calculate the mean and standard deviation for the following data: [6]

Series	Erequency	Series	Frequency	Series	Frequency
15-20	2	35-40	15	55-60	16
20-25	5	40-45	20	60-65	13
25-30	8	45-50	20	65-70	n.
30-35	ц	50-55	37.	70-75	50

Q40 Solve any two

SV-80 [2×8=16]

 Find the first and second derivative of the function tabulated below at x=0.6.

×.	84	0.5	0.6	2.7	0.8
\mathbf{F}_{i}	1.58%	1.7974	2.0442	2.3375	2,6511
sisting .	Stirlings			199220	

- b) Evaluate $\int_{1}^{1} (2x^{2}+1) dx$ ming two associated points of Gaussian Quadrature.
- c) Use Romberg's method to evaluate $\int_{0}^{1} \frac{dx}{(1+x)}$

Q5) Solverary petr-

2×8-161

compare y(0,1) for the equation given below with y(0)+1, using Faller's

method in five steps $\frac{dy}{dx} = \frac{y-x}{y+x}$.

b) Using Range-Kutta method of fourth order, find y(0.8) connect to four decimal places for the equation given below if y(0.6) = 1.7379 in two steps.

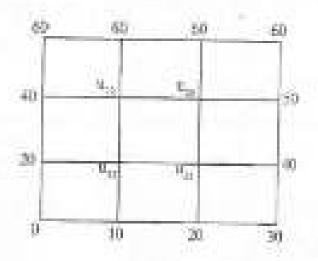
 $\frac{dy}{dt} = y - x^2$

- c) Find the dominant eigen value and the corresponding eigen vector of
 - $\begin{bmatrix} 1 & 6 & 1 \\ 1 & 2 & 0 \\ 0 & 6 & 3 \end{bmatrix}$

Q4) a) Classify the following partial differential equations

 $0 \qquad U_{ss} - 2U_{ss} + U_{ss} + 3U_s - 4U_s = 3x_s 2y$

- $i) = (X \in I) \cup_{ij} 2(x + 2) \cup_{ij} + (x + 3) \cup_{ij} \cos(x + 2y).$
- $|k\rangle = U_{xy} + 4U_{yy} + \left\{x^2 + 4y^2\right\} U_{yy} = \sin(x+y)$
- b) Solve U_a+U_b= 0 in the square meth gives below. Perform three iterations. [12]



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SV - 80 Total No. of Pages : 4

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S.E. (Mechanical Engineering) (Part - II) (Semester - IV) (Revised) Examination, May - 2018 FLUID AND TURBO MACHINERY Sub. Code: 63362

Day and Date : Friday, 11 - 05 - 2018 Time : 19.00 u.m. to 1.00 m.m.

Total Marks: 101

183

3

Instructions:

- All questions are compalisary.
- 2) Figures to the right side indicate full marks.
- 3) Asymme sultable data, if necessary and indicate clearly.
- 4) Use non-programmable extension is allowed.
- Q1) a) Explain different efficiencies of hydraulle turbinat
 - b) A Peltim wheel is to be designed for following specifications
 - 3 Staft Power = 13250 kW
 - Head = \$00 m
 - (ii) Speed = 600 rpm
 - iv) Peripheral velocity 0.46 J2g FI
 - NJ Overall efficiency = 85%
 - vi) The diameter of the jet is not exceeding one sixteenth the wheel diameter.

Take scotficient of velocity 0.97 and determine,

- 1) Discharge through tarbine
- 2) Dameter of wheel
- Dimeter of jet
- 4) Number of jet required

OR-

c) A Pelton wheel is revolving at a speed of 190 rpm and develops 5150.25 kW when working under head of 220 m with an overall efficiency of 80%. The speed ratio for thabino is given as 0.47. Determine unit speed, unit discharge and unit power. Also find speed when this turbine is working under a best of 140 m. [8]

 RTO_{c}

- Q2) a) State working principle of Reaction turbine and explain working of any one reaction turbine. [5, [8]
 - b) A Prancis turbine with overall efficiency of 75% is required to produce 148.25 kW power. It is working under a head of 7.62 m. The propheral

velocity = 0.26 $\sqrt{2g \Pi}$ and radial velocity of flow at inlet is 0.96 $\sqrt{2g \Pi}$. The whoels runs at 150 rpm and hydraulic losses in tarbics are 22% of available energy. Assuming radial discharge. [8]

Derenatioe:

- ij Guide blade angle,
- i) Wheel vane angle,

ii) Uiameter of wheel,

iv) Width of wheel at infet.

OR.

- c) A conical draft tube having diameter at the top as 2 m and preasure head of 7 m of water (vacuum), discharges water at the outlet with a velocity of 1.2 m/s at the rate of 25 m/s. If atmospheric pressure head is 10.3 m of water and losses between the inlet and outlet of the draft tube are negligible, find the length of draft tube immersed in water. Total length of tube is 5m. [8]
- Q3) a) Explain construction of contribugal pump and define different heads available for pump. [8]
 - b) Write a short note (any two);
 - Explain multistage of pump.
 - What is Cavitation and also comments on effects, precautions.
 - ti) Explain performance curves of pump.

$0R^{\circ}$

c) Solve following problems,

[10]

 $\{10\}$

- (i) A centrifugal pump is used to discharge 0.118 m//s of water at a speed of 1450 spin against a head of 25m. The impellar diameter is 250 mm, its width at putlet is 50 mm and numerative efficiency is 75%. Determine the vare angle at outer periphery of impellar.
- Find the number of pumps coquired to take water from a deep well under a total head of 89m. All pumps are identical and are running at 800 rpm. The specific speed of each pump is given as 25 rpm while the rated capacity of each pump is 0.16 m/s.

1101

1103

- Q4) a) Why the elegrance volume is provided in reciprocating air compressor. Explain its effect on the work required to drive the compressor. [8]
 - b) Write a short note (any two):
 - Explain root blower and vane blower compressor.
 - b) Different efficiencies of reciprocating air compressor.
 - 0-10 Different applications of compressed alr.

QR.

- Solve following problems.
 - b A two stage single acting reciprocating air compressor draws in air at a pressure of 1 har and 17°C and compresses it to a pressure of 60 bar. After compression in the low pressure cylinder, the sir is cooled at constant pressure of 8 bar to a temperature of 37°C. The loss pressure cylinder has a character of 150 mm and both cylinders have 200 mm stroke. If law of compression is PV⁻¹⁰^m constant, find the power of the compressor, when it runs at 200 rpm. Take R = 287 J/kg K.
 - ii) A single stage reciprocating air compressor takes in 7.5 m³/min of single 1 for and 30°C and delivers it at 5 bar. The choosing is 5 percent of the stacke. The expansion and compression follows PV¹³ – constant. Calculate Temperature of delivered sir volumetric efficiency δ₀ power of the compressor.
- Q5) a) Explain terms Surging, Checking, and Stalling for centrigual air compressor. [8]
 - b) A centrifugal compressor running at 10000 rpm delivers 660 m³/min of free air. The air is compressed from 1 bar and 20°C to pressure ratio of 4 with isomorphic efficiency of 82%. Blades are radial at outlet of impeller and flow velocity of 62 m/s every be assumed throughout constant. The outer radies of impeller is twice the inner and the slip factor may be assumed as 0.9. The blade area co-officient may be assumed 0.9 at inlet. Calculate:
 - Theoretical power:
 - inpeller diameters at inlet and outlet. Also find breadth of impeller grinket.

6378

181

ASK-SA

- c) An retial flow compressor having eight stages with 50% reaction design compresses air in the pressure ratio of 4(1). The air enters the compressor at 20°C and flows at a constant speed of 90 m/s. The rotating blades of compressor rotate with a mean speed of 180 m/s. Isentropic efficiency of the compressor taken as 82%. Calculate,
 - Work done by machine.

ii) Bludzaughts

85

Take y = 1.4 and c = 1.005 kUkg K.

- Q6) (i) Compare gas turbing with reheating and intercooling. [8]
 - A gas turbine unit has a pressure ratio of 5:1 and maximum cycle temperature of 610°C. The isentropic efficiencies of the compressor and turbine are 80% and 82% respectively. Calculate the power output in kW of an electric generator geared to the turbine when air enters the compressor at 15°C at the rate of 16 kg/s.

Take $\gamma = 1.4$ and $q_c = 1.005$ kJ/3g K for the compression process and

 $\gamma = 1.333$ and cp = 1.11 kDkg K for the expansion process. [8]

c) In secoil-gas turbles installation, it is taken at pressure of 1 bar and 27°C and compressed to a pressure of 4 bar. The oil with calorific value of 42000 kJ/kg is barnt in the conduction chamber to mike the temperature of air 550°C. If the air flows is the rate of 1.2 kg/s, find the net power of installation and air fuel ratio. [8]

Take c, = 1.05 kJ/kg K and c, = 0.714 kJ/kg K.

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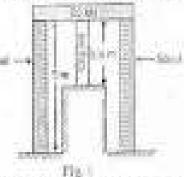
SV-81 Total No. of Pages 12

S.E. (Mechanical) (Semester - IV) Examination, May - 2019 ANALYSIS OF MECHANICAL ELEMENTS Sub. Code: 63361

Day and Date : Thursday, 16-05-2019 Time : 2:30 p.m. to 5:30 p.m.

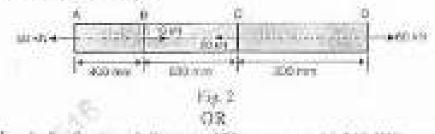
Total Murks : 190

- Instructions: 1) All questions are compulseey.
 - 2) Assume suitable data wherever necessary and state it elegets.
 - 3) Figures to the right indicate fall marks,
 - Drow must and labeled sketches wherever necessary.
 - 5] Use of non-programmable calestator is alloroal.
- Q1) a) Two steel rods and one coppar rod each of 50mm diameter together support a load of 60 KN as shown in Fig.1. Take E =200 Gpa and E =100 GPa. [112]



 The bar ABCD of uniform cross section 20 mm in diameter is subjected to load as shown in fig.2 Determine.

- i) Total elongation of the bor
- Maximum stress in the bar
- iii) Strain in each part



A hollw shaft of external diameter 120mm transmits 300 KW power at 200 rpm. Determine internal diameter of the shaft it the maximum stress is not to exceed 60N/mm². [6]

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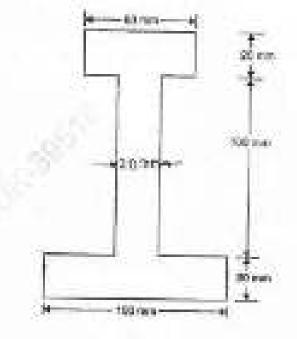
SV-81

Q2) Draw SFD and BMD for loading condition shown in fig.3. Locate point of controflecture if any. [16]



Q3).

A beam of 1 section is simply supported over a span of 4 m determine the load that the beam can carry per meter length, if the allowable stress in the beam is 30.82 N/mm²(Tensile). [16]





- (Q4) a) Derive the expression for the principal stresses and maximum shear stress. Sor a member subjected to simple shear stresses. Show the locations of principal planes and planes of maximum shear. 191
 - b) The I section beam section shown in figure is 320mm x 140mm with web 10 mm thick and flunge 18 mm thick. Find the stresses and show the shear stress distribution if it has to resist a shear force of 40 kN [9] OR.

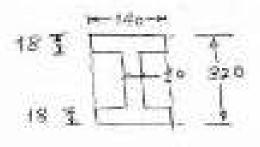
The stresses of the two perpendicular planes passing a point in a strained material neb 100 MPa (sensile), 80 MPa (compressive), and 60 MPa (Shear) as shown in figure. Determine the normal and shear stress components on a plane at 60° to that of 100 MPa stress and also the resultant and its infoliration with normal components or the plane.

- (Q5) a) Derive the equation of slope and deflection of a simply supported beam of length L subjected to uniformly distributed load over whole length using double integration method. [8]
 - b) A cantilever beam of span (in is carrying a point load of 20 kN at a distance of 3 m from the fixed end. If the moment of inertia of the beam is 1x10⁶ mm4 and the modulus of elasticity is 21x10⁶ N/mm². Determine by moment areas method, the slope and deflection of cantilever at the fixe end. [8]

松化。

State the importance of thereics of failure and explain the maximum shuar theory (Guest's theory). [8]

- Q6) a) Explain the concept of equivalent length and stenderness mile of the column. Discuss the limitations of Euler's formula: [8]
 - In an axially loaded shaft shown in figure, had is gradually increased to 80 kN. Find the total strain energy produced in the bar. Use E=2.1x10⁵N/ mm².



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SV - 81 Yotal No. of Pages 15

S.E. (Mechanical) (Part - II) (Semester - IV) (Revised) Examination, May - 2018 THEORY OF MACHINES - 1

Sub. Code; 63363

Day and Dute : Monday, 14-45-2018 Time (9.30 a.m. to 1.20 p.m.

Total Marks : 100

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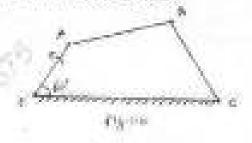
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- Attemptal questions.
- 2) Figures to the right builders fall marks.
- 31 Draw next labeled electric whereas mechanics,
- 4) Assume suitable deta, if ascessery and state clearly,
- 5) Use of cons-programmable calculator is allowed.
- Q1) a) Write a note on different types of kinematic pairs with the help of next sketches. [3]

OR^{1}

A Hoeles's joint connects two shafts inving an angle of 18° between them. The driving shaft rotates at 1200 s.p.m. The driven shaft has a flywheel of mass 7 kg and railins of gyration 90 mm. Find the meximum angular acceleration of the driven shaft and the maximum torque required. [N]

- b) A four bar exchanism is as shown in fig. 1, b. Lengths of various links are: OA = 225 mm, AB = 375 mm, BC = 350 mm and OC = 650 mm. Crank OA retains at 320 c.p.m. Louses all the instantianeous centres and find: [8]
 - 1 velocity of B and
 - ii) angular velocities of AB and BC.

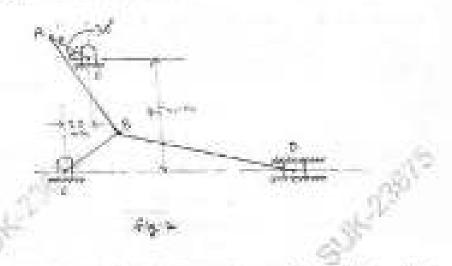


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- SV 81
- Q2) The dimensions of the various links of a mechanism shown in fig. 2 are: CA = 30 mm, AB = 30 mm, BC = 45 mm and BD = 120 mm. [18]

The crisik GA rotates uniformly in clockwise direction at 120 s.p.m. For the given configuration, find

- a) wincity of D.
- b) acceleration of D zot-
- (i) atgular seculieution of link RD.



Q3(a)

Derive the equation for friction torque in case of that collar pivot bearing assuming the condition of uniform pressure. [8]

 OR_{c}

Derive the equation for friction tangue is case of control proof bearing assuming uniform wear with issuel notations. [8]

b) A content pivot supports a shaft having an axial load of 15 kV and has an argie of onte equal to 90°. The shaft is rooting at 150 r.p.m. The intensity of pressure is equal to 0.3 MIN°m² and the coefficient of transmiss 0/05. Determine the power lost in friction assuming the condition of and/orm pressure.

140

With next algolates we its classification of followers. 041.00

Construct the case profile for the following specifications: hγ.

Least radius of cam = 25 mm; Diameter of rollar = 25 mm; Angle of rise 150°; Angle of fail = 150°; Angle of dwall in between = 45°; Lift of follower = 40 mag

During the lift follower moves with SHM and during the fall is moves with unidown acceleration and deceleration. The line of stroke of follower is off set by 12.5 mm unsures right of centre of curs. [14]

Q5) a) Explain law of belting:

[0]

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Explain initial texakor in belt drive.

- b) An oper belt drive connects two pulleys 1200 rem and 500 mm diameters, its parallel sheets 4 m apart. The maximum tension in the belt is 1869.3 N. The coefficient of friction is 0.3. The driver pulley of 1200 mmidiameter resistee at 200 rpm. Calculate the power transmitted by the fittive and tongue on each pullay. CRUE.
- Derive the equation for relation between speed and height of Parter 06118 dowerrion. [6]

OR

Explain effort and power of governor.

5) In a spring loaded Hartcell governor, the extreme radii of rotation of balls are 80 mm and 120 mm. The weight ann and showe ann of bell erons, lever are equal in length. Mask of each ball is 2 kg. The speeds as the two extreme positions are 400 and 420 rpm. Determine spring stillness and britial compression of spring. Neglet the sizes mass, [101]

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Bill Halling

SV = 82 Total No. of Pages : 4

S.E. (Mechanical) (Part - II) (Semester - IV) (Revised) Examination, May - 2019 FLUID AND TURBO MACHINERY Sub. Code: 63362

Day and Dute : Menday, 20 - 05 - 2029 Theor: 2.30 pain, 15 5.30 p.m.

Tatal Marks : 100

hetraclass: 1) Altynationarcomplary.

Seat. No.

- 2) Figures to the eight indicate fall marine.
- 2) Answer soitable data if speciary.
- 4) Use of a co-programmable calculator is offered.

Q(1) a) Show that the maximum hydrodic officiency of petron wheel is given by who ¹⁺²⁰⁰/₂ (where '\$' is bucket outletangle. [8]

5) A pelitin wheel has to be designed for the following data power to be developed ~ 6,000 KW Net head available = 300m, speed = 550 rpm; Ratio of jet diameter to wheel diameter = 1/10; and overall efficiency = 85%. Find the number of jets; diameter of the jet, diameter of the wheel and the quantity of water required. (8)

OR_{c}

(c) A polynn wheel produces 1000 hp under a growthoud of 200m. Its mazzle has a diameter of 10 cm and the losses in pipe line due to friction amount to 90 Q² where 'Q' is the discharge in m's. Assuming the growthout head and efficiency of the wheel to be constant and ev for the moutel as 0.08, find the discharge and overall efficiency. If the power produced is reduced to 800 kp by openning the nearble in the moutel, discharge [8].

PTO

- Q2) a) Explain the construction of francis & hipmentarbines along with working by drawing near along.
 - b) Design a francis turbine numer with the following data. Not hard, H = 68m, speed N = 750 mm, output power P = 330 KW, ηh = 94%, η_h = 85% flow ratio φ = 0.15, breadth ratio u = 0.1, inner diameter of runner is (%) cuter diameter. Also assume 6% of circumferential area of the runner to be occupied by the thickness of the varies. Velocity of flow remains constant throughout and flow is ratio at exit. [8]

083

- c) A kaplan turbing produces 60,000 kw under and hand of 25m with an overall efficiency of 90%. Taking the value of speed ratio 'ku' as 1.6, flow ratio y as 0.5 and the hab diameter as 0.35 times the outer diameter, flod the diameter and speed of the tables. [8]
- Q3) a) Explain the construction & working of centrifugal pump by drawing a next sketch [8]
 - b) Write short notes on (any two).
 - Caviation.
 - ib Multistaging of purepa

iii Printing & its need

OR:

c) Pind the power required to drive a centrifugal pump which delivers 40 liters of water per second to a height of 20m through a 150mm dimester and 100m long pipeling. The overall efficiency of pump is 70% and Damy's f = 0.06 for the pipeline. Assume inlet losses in section pipe equal to 0.33m [10].

Q4) a) Define and explain different efficiencies of Recipiorating compressor

b) Write Short notes on any two:

[10] [8]

 $\{10\}$

14039

- b Construction and Working of Vane Idower.
- Explain affect of diseases volume on reciprocating compressor performance and define volumetric efficiency.
- ii) Workdone in Two stage reciprocating air compressor.

OR:

3m

- 612 S Solve following two problems.
 - Find the percentage saying in work by compressing air in two stages **B**. from 5 bar to 7 bar instead of in one stage. Assume compression index 1.35 in both the cases and optimum pressure and pempleteintercooling in two stage compresses. [話][
 - A single Stage reciprocating air compressor is required to compress I kg of air from 1 bar to 4 bar. The institution temperature is 27 °C. Compare the work requirement in the following cases. (5))
 - DF Isochannal Compression
 - 23 Compression with PV11+ constant
- Explain construction and working of anal flow compressor with next Q50 m sketch. Also define degree of reaction for the axial flow comprisaor.[0]
 - b) Air at temperature of 290 K eaters a ten stages axial flow compressor at rate of 3 kg/s. The pressure ratio is 0.5 and the isostropic efficiency is 50 %, the compression process being adiabatic. The compressor has symmetrical blades. The axial velocity of 110 m/s is written access the stage and the mean blade speed of each stage is 180 m/s.

Determine the direction of the air at entry to and exit from the botter and states blades and also the power given to the air. Assume Cp = 1005 Dick. 7 = 1.4. 183

OR.

- A contrifugal air compressor compresses the air from 1 but to 4 hor. 100 lener and outer diameters of the impeller are 0.2 m and 0.4 m respectively. The impeller biade magic at inlet and exit are 30° and 40° respectively. Are enters the impeller black radially at a speed of 15 m/a. Determina, [8]
 - Speed of onpeller in run. а.
 - ŵ. Work done per log of sin-
 - (iii) Thickness of the impeller blades for a mass flow rate of air as 0.5 ight if the impeller has 30 blodes and width of each impeller blode. is 5.5 cm. Assume the specific volume of air as 6.82 m//kg and velozity of flow is constant. BOHRARD

-Sec

Take Cp = 1.005 kJ/kg K and T = 1.4.

Ster And

- Q49 4) Explain with nost skotch open cycle gas turbing with Reheat and draw its T-8 Diagram. 381
 - b) A gas tarbine unit receives air at 100 kPo and 200 K and compresses it adiabatically to 520 kPa with efficiency of the compressor 85 %. The fuel has a beating value of 44180 kj/kg and the fuel alcoatio is 0.017 kg fuel/kg air. The turbine internal efficiency is 90 %. Calculate the compressor work, turbine work and thermal efficiency. Take Cp for air and gases 1.005 kJ/kg K and y 1.4. [8]

DR.

c) The sir enters the compressor of an open cycle gas turbine at pressure of 1 bar and temperature of 20°C. The pressure of the sir after compression is 6 bar, the hemopic officiency of compressor and turbine use 80% and 85% respectively. The sir fuel satio used is 9001. If the flow rate of sir is 3 kg/s, find [8].

The compressor power and turbing power.

ii) Net Prover developed

Contraction

Take Cp= 1.0 k3/ kgK and y=1.4 of sir and gas. Calorific value of fast 41800k3/kg.

XXX

140

SV-82 Total No. of Pages : 3

S.E. (Mechanical) (Part-II) (Semester-IV) (Revised) Examination, May - 2018 MACHINE TOOLS AND PROCESSES Sub, Code : 63364

Tray and Date (Wednusday, 16 - 05 - 2018) Time : 10.00 g.m. to 1.00 p.m. Total Marks : 100

Instructions:

Seat. No.

- D All Questions are compulsivity.
- 2) Figures to the right indicate foil morks.
- 3) Assume suitable data, if necessary.
- 4) Use of Non-programmable Scientific Calculator is allowed.

Q1) Attempt any four (4 marks each):

- Explain the properties of core sand. Suggest the methods to measure the same.
- Briefly explain the function of numers and gates in the gating system.[4]
- c) What are the steps involved in pressure dis casting. [4]
- Draw near sketch of are furnate and label all the parts.
 [4]
- c) State the defects related to melting process? Explain any two of them.[4]

(O2) Attempt my four (4 marks each):

- How does cold rolling differ from het rolling in terms of the process and product? [4]
- b) List the different stages in drop forging process in production of a component such as spannet. [4]
- c) Show by schematic sketches the process of forward extrusion. Give two examples of components produced by extrusion. [4].
- d) What is the difference between a wire drawing operation and extrusion?[4].
- why is the strength of rolled part is better that a cast place. [4].

PTO.

SV-82

O3) Write a short note on (Any Three):

30	Advantages and limitations of centrifugal casting process.	间
b)	Defects in estrusion.	[6]
-c)	Blow molding.	[6]
d).	Calculating process for plastic.	141

()4) Attempt any four (4 marks each):

- Calculate the geter train for cutting following threads on a lathe having lead screw 4 TPL.
 - 6 TPI

The lathe is supplied with a change gost set from 20 to 120 teeth in slope of 5 teeth and an additional gear of 127 teeth. [4]

- b) Describe the various work holding devices used on turnet lathe. [4]
- Discuss in brief methods of classification of boring machines. [4]
- d) Draw a near scereb of radial drilling machine and label all the parts. [4]:
- Where would you propose use of face plate on a [athe? Justify your answer. [4]

Q5) Attempt any four (4 marks each):

- a) What is meant by the term 'spead' & 'feed' of a planet. [4]
 b) Exclusin with next sketch working principle of shapet. [4]
- c) Describe the function of any four parts of milling machines. [4]
- d) Sketch and describe the following operations on milling machine: [4]
 - it Angularmilling
 - in Keyway milling
- e) Which method of monufacturing of a year is best suitable for helical gears? Give reasons: [4]

SV-82

Sarapite

Q6) Write a short note on (Any Three)

S.Maransa

S.S. TETE

$\widetilde{O}(\cdot)$	Various operations performed on drilling machine,	[6]
$b\hat{j}$	Electrical Discharge machining advantages and findmions,	[6]
41	Applications of Laser beam machining process with sketch.	[6]
d)	Ultrasonic machining process.	[6]

SV-83 Tirial No. of Pages : 3

S.E. (Mechanical) (Part - II) (Semester - IV) Examination, May -2019 THEORY OF MACHINES - I Sub, Code : 63363

Day and Date : Wednesday, 22 - 05 - 2019 Time : 2.30 p.m. to 6.30 p.m.

heat. No.

Total Marks : 100

- Instructions: 1) All questions are compulsory.
 - 2) Figures to the right indicates full marks.
 - 3) Assume if necessary, suitable dars and state clearshy.
 - 4) Use of nonprogrammable calculator is parasimat.
- Q1) a) Explain Gruebler's criterion of degrees of freedom of plane mechanism. Also give examples of locked chain, constrained chain and un-constrained chain. [8].

OR.

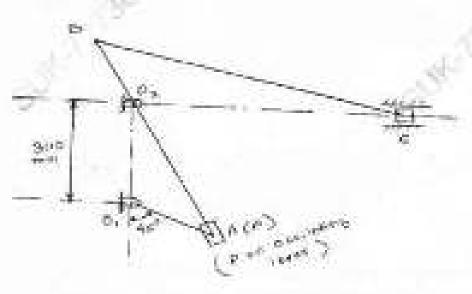
- Doffine kinematic pair. Also Explain classification of kinematic pain with next skytch.
- (b) A reciprocating engine has connecting rod 20 cm long and crank 5 cm long. By using Klein's construction, determine velocity and acceleration of piston and angular acceleration of connecting rod when the crank has turned through 45° from IDC clockwise and is rotating at 240 n.p.m [8].
- Q2) Draw the velocity and acceleration diagram for the Withworth mechanism shown in following figure. The crank O_iA rotates at 120 ipm clockwise. Determine; (18)
 - a) Velocity and secularation of tam c

ETO

161

b) Annahmacceleration of link BC.

Various link lengths are; $O_iO_j = 360$ mm, $O_jA = 200$ mm, PB = 700 mm, BC = 800 mm, O_i



Q3) a) Derive the equation of efficiency of screw jack with square threads: [8]

 OR_{\odot}

- Derive the equation of torque required to overcome the friction in conical pivot bearing considering uniform pressure theory. (8)
- (b) A conical pivot with angle of cone as 100° supports a load of 18 KN. The extremal radius is 2.5 times the internal radius and the shaft routies at 150 rpm. If the intensity of pressure is to be 300 KN/m2 and coefficient of friction is 0.05, what is the power lost in friction? [8]

Q4) a) Explain classification of followers with near sketch.

b) Construct the profile of a carn to sait the following specifications:

Cam shaft diameter ~ 40 mm; Least radius of cam = 25 mm; Diameter of roller - 25mm Angle of lift = 120°; Angle of dwell - 45° Angle of full - 150°, angle of dwell = 45°. Lift of the follower = 40 mm; During the lift, the motion is S.H.M. During the full the motion is uniform acceleration and doceleration. The speed of the cam shaft is uniform. The line of stroke of the follower is off-set 12.5 mm from the centre of the cam [12].

Q5) a) Explainable and creep of belt.

SV-83

161

£63)

SUN-TRING

OR.

Explain belt transmission dynamometer with near sketch.

- b) A shaft is rotating at 200 rpm and drives another shaft at 300 rpm and transmits 5 Kw power through a belt. The belt is 100 mm wide and 10 mm thick. The distance between shafts is 4 m. The smaller pulley is 0.5 m in diameter. Calculate spees in belt if it is open belt drive. Take μ = 0.3.
- Q6) a) Explain and derive the equation for height of Porter governor. [6].

OR

- a) Explain Effort and Power of a Governor.
- b) A Hartnell governor having a central sleeve spring and two right-angled bell trank lovers moves between 250 r.p.m. and 310 r.p.m. for a sleeve lift of 15 mm. The sleeve arms and the ball arms are 80 mm and 120 mm respectively. The levers are pivoted at 120mm from the governor axis, and mass of each ball is 2.5 kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine: loads on the spring at the lowest and the highest equilibrium speeds, and stiffness of the spring. [10]

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SV-84 Tend No. of Pages : 2

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S.E.(Mechanical) (Part - II) (Semester - IV) (Revised)
Examination, May - 2019
MACHINE TOOLS AND PROCESSES
Set Cat cated

Sub. Code: 63364

Day and Date : Friday, 24 - 05 - 2019 Time : 2.30 p.m. to 5.30 p.m.

Scal

New

Tetal Marks : 100

Instructions (I) All questions are encogalisory.

- 2) Pigners to the right indicate full marks.
- D) Assumes of table data, if necessary.
- 4) Use of Non-pringratureable Scientific Calculator is allowed.

Q1) Attempt any four of the following.

4)	What are the steps involved in notal casting process?		141
-63	State the function of each element in guing system.	. 3	0 [4]
${\bf c})$	Explain important properties of molding sand.	10	[4]
4)	Which casting method is used to produce piston in an IC en the same in brief.	gine? By	optain [4]
10	Draw next sketch of cupola fumace.		[4]

Q2) Attempt any four of the following.

10	Define forging. Explain with neutaketch open die forging process.	[4]
10	Compare direct & indirect Extrusion process.	[4]
e)	Explain the process of tube drawing in brief	[4]
4)	State the advantages of cold rolling compared to hot colling	141
9	What are the defects associated with the forging process?	141
1.00		

ETO.

504.22

161

16B

[6].

141

141

SULADAR

Q3) Write a short note on (Any Theod).

- Examples of injection molding for production of plastic parts 65 161
- 63 Calendaring^{**}
- Application of rolling 63.
- Cleaning of casting. *а*з.,

Q4) Attempt any four of the following.

- Calculate the gear train for coming the 6 TPI pitch on work piece if the ŵ. lind strew of latin is 4 TPl. The lathe is supplied with a change gear set from 20 to 120 teeth in steps of 5 teeth and an additional gear of 127 teeth. H bù.
- Draw block diagram of curret lathe. Name different parts [4] c_{12}
- State work holding devises used on lathe. Draw sketch of any two. [4]
- Draw block diagram of radial drilling machine. 18
- Explain construction of hurizontal boring machine. 68. 14T

Q5) Attempt my free of the following.

- Draw next sketch of outer return muchanism used in shaper-630 141 State classification of planer. Explain working of double bousing planer [4] 695
- Explain constructions of hocizontal milling machine, 63 Ht
- Describe gear cutting on milling machine. dM
- With the help of neut sketch explain gear shaping process in brief. θŤ. 643.

Q6) Write a short note on (Any Thrne).

5114-2552

-99) -	Abrasive jet machining	[6]
b)	Ultrasonic machining	161
$\langle 0 \rangle$	Bar fooding Mechanism	161
d	Operations performed un milling emchine	[6]

0 0 0

12.0

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Tatud Nev of Pages 13

Total Marks : 199

[8]

S.E. (Mechanical) (Part - II) (Revised) (Semester - IV) Examination, May - 2015

THEORY OF MACHINES - I

Sub, Code : 63363

Day and Date : Tuesday, 12 - 05 - 2015

Time : 09.00 a.m. to 01.00 p.m.

Instructions :

Sent No.

- 1) Attemptaltquestians.
- 2) Figures to the right indicate fall marks to the question.
- 3) Draw mut labeled sketch wherever accessary.
- 4) Another saitable duta, if necessary and state clearly.
- 5) Use of non-programmable indeutator is allowed.

Q() a) Explain the inversions of single-alider crunit chain with next eleration.

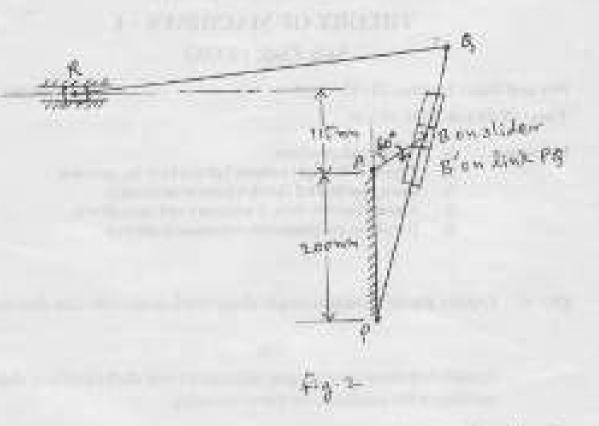
OR.

Explain Ackerman steering gear mechanism with the help of near diagram and derive the condition for correct steering.

b) The trank and connecting rod of a reciprocesting engine are 100mm and 400mm respectively. The trank is rotating at 200 r.p.m. as shown in fig. 1.c. Find, with the help of Klein's construction, the velocity and acceleration of the piston. [8]

P.T.O.

Q2) The driving Crank AB of the quick return mechanism as shown in fig. 2 revelves at uniform apped of 200 np.m. Find the velocity and acceleration of the tool-box R in the position shown when the crank makes an migle of 60^o with the vertical line PA. The dimensions of the links are: AB = 75 mm, PQ = 175 mm, QR = 500 mm, PA = 200 mm. [18]



(23) a) Derive the equation for friction tocque in case of flat collar proof bearing assuming uniform pressure with usual potations. [8]

OR-

Derive the equation for torque required to lift the load by acrow jack.

b) A conical pivot bearing supports a vertical shaft of 200 mm diameter. It is subjected to a load of 30kN. The angle of cose is 120° and the coefficient of friction is 0.025. Find the power lost in friction when the speed is 140 r.p.m. by assuming :

-4-

- i) uniform pressure and
- in uniform wear.

181

6

S - 381

- (24) a) Draw sketch of displacement diagram, velocity diagram and acceleration diagram for uniform acceleration and retardation motion of follower. [4]
 - b) Draw the profile of a cam with oscillating tollar follower to the following specification. [14]
 - Follower to move conwards through an augular displacement of 20st during 120st of cam rotation with SHM.
 - Follower to return to its initial position during 120° of commutation with SHM.
 - [ii] Follower to dwell for remaining 120° of cam rotation. The pivot of the oscillating follower is 120 mm from axis of renation cam. The distance between the pivot center and the roller center is 110 mm. The minimum radius of cam is 45 mm and the roller diameter is 30 mm.

(Q5) a) A shuft rotating at 200 r.p.m. drives another shuft at 300 r.p.m. and transmits 6kW through a belt. The belt is 100 mm wide and 10 mm thick. The distance between the shufts is 4m. The smaller palley is 0.5m in dimneter. Calculate the stress in belt, if it is [10]

An open belt drive und

A cross belt drive.

Take coefficient of friction as 0.3. Neglect belt thickness while calculating velocity.

 b) Derive the relation between tension in balts on tight side and on alack side.
 [6]

OR.

Explain bolt transmission dynamometer with next sketch.

(26) a) The arms of Portia governor are pivoted on the governor axis and are each 250 mm long. Mass of each ball is 5 kg and the mass of the sleeve is 40 kg. The arms are at an angle of 30° to the governor axis in hovernost position of the sleeve. Lift is equal to 50mm. Determine the force of friction at slaeve if the speeds at the memorat the sleeve start lifting from lowermost position, is some as the speed at the moment it falls from uppermost position. Also determine the range of the governor. [10]
 b) With the help of next sketch explain Hartcell governor. [6]

-3-

Explain controlling force maya.

8 - 377Tatal No. of Pages (4

S.E. (Mechanical) (Part - II) (Semester - IV) Examination, May - 2015 THEORY OF MACHINES-1 Sub. Code: 43596

Day and Date : Thursday, 14 - 05 - 2018.

Total Marks: 100

Time : 9.08 a.m. to 1.00 p.m.

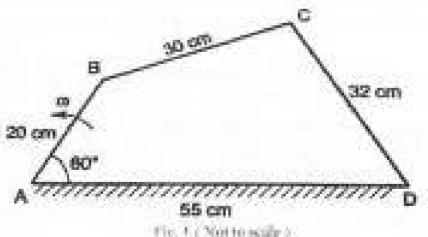
Instructions:

See Note

- 13.77 0.2 and 0.5 are compulsory, from the remaining quastions of each section maswer any two questions.
 - Figures to the eight indicate full murlas. 21
 - Braw next labeled sketch wherever necessary. 26
 - Assume if necessary, suitable data and state elevely. 10
 - Use of Non-programmable valuation is permitted. 55

SECTION - 1

- What is the degree of freedom of mechanism? Explain Katzbach criterion O(t, u)for finding number of degree of freedom of plane mechanism. $\{6\}$
 - Explain types of constrained motions, 14 L
 - In a four bar chain as shown in Fig.1 AB = 20cm, BC = 30cm, CD = 32 63 em and AD = 55 cm. Crank AB rotates at a uniform speed of 200 rpm in anticlockwise direction. When the crank AB has turned 60°, locate all instantaneous centres and find the Augular velocity of link BC 161

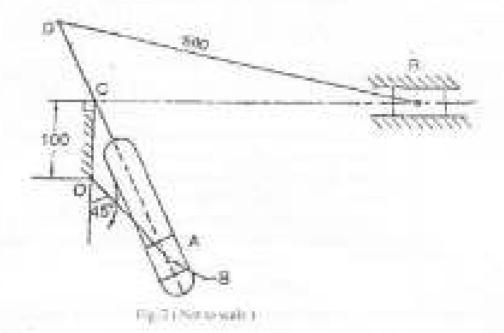


ETO.

[41]

(22) In a Whitworth quick rature contient mechanism as shown in Fig. 2, OA is a small rotating in 30 rpm in a clockwise direction. The dimensions of various links are: OA = 136 mm, OC = 100 mm, CD = 125 mm, and DR = 300 mm. Determine the acceleration of the sliding block R and angular acceleration of the slotted lever CA. [18]

S - 377



- Q3) a) Sketch and explain Hart's straight line mechanism and prove that it is exact straight line mechanism. [8]
 - (b) Two shufts are connected by a Honke's joint. The driving shaft revolves uniformly at 500 rpm. If the total permissible variation in speed of the driven shuft is not to exceed ± 6% of the mean speed. Find the greatest permissible angle between the centre lines of the shufts. [8]
- Q4) a) Derive an expression for velocity and acceleration of piston in slider crass mechanism. [8]
 - b) The connecting rod of a gaseline engine is 300 mm long between its centres. It has a mass of 15 kg and mass moment of inertia of 7000 kg-mm². Its centre of gravity is at 200 mm from its small end centre. Determine the dynamically equivalent two mass system of the connecting rod if one of the masses in located in the small end centre. [8]

8-377

SECTION - IF

- Q5) al. Draw displacement, velocity and neceleration diagram for uniform acceleration and retardation motion program of follower. [4].
 - The following data relate to a case operating an oscillating rollar follower: Minimum radius of case = 44 mm

Diameter of collest = 14 mm.

Longth of follower arm = 40 mm

Distance of fluctum center from cam centre = 50 mm

Angle of ascent - 70*

Angle of descent = 1057

Angle of dwell for follower in highest position ~ fill*

Angle of esciliation of follower = 283

cian rjim = 100

Draw the profile of cam if the ascent and descent takes place with SHM. Also calculate maximum velocity and acceleration of follower for outward and return stroke. [14]

- Q69 a) Derive the condition for muchman power transmission in case of flat belt drives considering centrifugal tension. [6]
 - b) A conical pivot supports a load of 25 KN, the cone angle being 120°, and the intensity of normal pressure does not exceed 0.25 Mpa. The external radius is twice the internal radius. Find the inter and outer radii of bearing surface. If the shaft rotates at 180 rpm and the coefficient of filtetion is 0.15, find the power lost in friction assuming uniform pressure.

[10]

63

Q7) a) What is difference between governor and flywheel?

b) Two panallol shafts, whose center lines are 4.8 m apart, are connected by open balt drive. The diameter of the larger pulley is 1.5 m and that of smaller pulley is 1 m. The initial tension in the belt when belt is stationary is 3 KN. The mass of belt is 1.5 kg/m length. The conflicient of friction between the belt and the pulley is 9.3. Taking centrifugal tension into account calculate power transmitted when smaller pulley tonstes at 400 rpm. [10]

8-377

- Q87 a) Derive the equation of the efficiency of an inclined plane when a body moves up the plane. [6]
 - b) A Harmell governor having a central sheeve spring and two right angled bell enablievers operates between 290 rpm and 310 rpm for a sleeve lift of 15 mm. The sleeve intos and weight arms are 80mm and 120mm respectively. The levers are pivoted at 120mm from the governor axis and mass of each fly hall is 2.5 kg. The ball arms are parallel to the governor axis at the lowest equilibrium speed. Determine loads on the apring at the lowest and the highest equilibrium speeds. Also calculate atifiness of spring. [10]