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Seat No.

B.E.(Mechanical)(Semester -VII)(New Course)
Examination, April - 2016
MECHANICAL SYSTEM DESIGN
Sub. Code: 47980

Day and Date : Saturday, 30 - 04 - 2016   **Total Marks :100**
Time :03.00 p.m. to 6.00 p.m.

Instructions :
1) All questions are compulsory.
2) Figures to the right indicate full marks.
3) Assume suitable data wherever necessary and state it clearly.
4) Draw neat labeled sketches wherever necessary.

$\frac{M}{I} = \frac{F}{Y} = \frac{E}{R}$

SECTION-I

Q1) a) Explain, the importance of aesthetic design considerations, in product design with the help of suitable examples. **[8]**

$\frac{\sigma}{y} = \frac{\sigma}{y} = \frac{E}{R}$

b) Discuss ergonomic considerations in design of displays and controls.**[8]**

M, σ, y

OR

$\frac{M}{E}$

Explain modelling of masses and inertia.

Q2) a) Discuss the stresses induced in thick cylinder. **[6]**

$\frac{\sigma b \cdot M y}{E}$

b) A shrink fit assembly formed by shrinking on tube over another, is subjected to an internal pressure of 60N/mm². Before the fluid is admitted, the internal and the external diameters of the assembly are 120mm and 200mm and the diameter at the junction is 160mm. If after shrinking on the contact pressure at the junction is 8 N/mm². Determine using Lame's equation, the stresses at the inner mating and outer surfaces of the assembly after the fluid has been admitted. **[12]**

M, σ, r, σ, R

P.T.O.

Q3) a) Explain the energy considerations used in design of brakes. **[8]**

b) The brake is shown in Figure I-1 requires and actuating force of 2000N at the end of the lever. Coefficient of friction is 0.3 and maximum pressure intensity is 1MPa. Determine the width of the shoe and the braking capacity. **[8]**
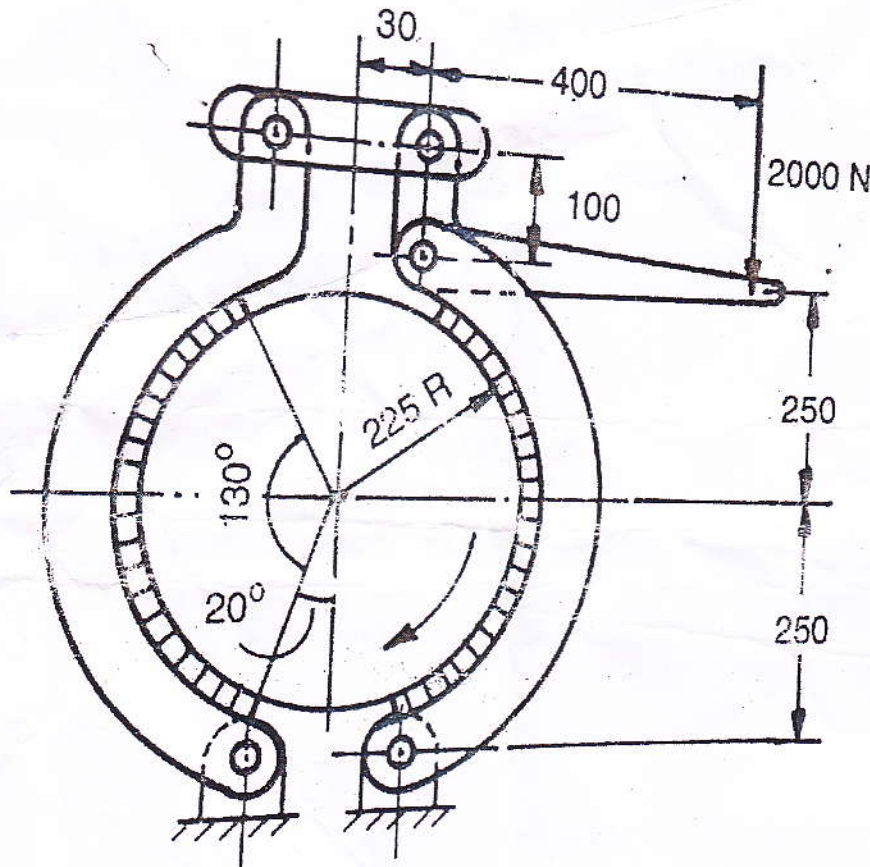

Figure I-1 Question 3 (b)

OR

An automotive single plate clutch consists of two pairs of contacting surfaces. The outer diameter of the friction disk is 270mm. The coefficient of friction of 0.3 and the maximum intensity of pressure is 0.3N/mm². The clutch is transmitting a torque of 531 N-m. Assuming uniform axial wear, calculate, the inner diameter of the friction disk and spring force required to keep the clutch engaged.

SECTION-II

Q4) a) Derive an expression for mean and standard deviation for a resultant combination when number of populations is combined. [6]

OR

Why multi-speed gearboxes are required in machine tools?

b) A multi speed gear box is to be designed for a headstock of a turret lathe for nine spindle speeds ranging from 30 rpm to 1000 rpm. If the gear box is driven by 5kW, 720 rpm electric motor through the belt drive. Draw the speed ray diagram and gearign diagram determine number of teeth on gears. Select the diameters of pulleys for belt drive. The standard pulley diameters are: 80, 90, 100, 112, 125, 140, 160, 180, 200, 224, 250, 280, 290, 300, 310, 355, 375, 400, 450, and 500 mm. [12]

Q5) a) What is the purpose of idlers? Explain any two types of idlers. [8]

OR

Explain Johnson's method of Optimum Design.

b) Design a tensile bar of length of 200 mm to carry a tensile load of 5kN for minimum cost out of following materials. [8]

Material	Mass Density (kg/m³)	Material Cost (Rs/N weight)	Yield Strength (MPa)
Steel	7500	16	130
Al-Alloy	3000	32	50
Titanium Alloy	4800	480	90
Magnesium Alloy	2100	32	20

Q6) Solve any two: [16]

    a)   Write a note on objectives of optimum design.

    b)   Discuss significance of standard normal distribution curve in the engineering statistical analysis.

    c)   State and explain basic consideration in design of multi spindle derives.

    d)   Write a note on belt take-up devices.

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