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SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR
(AUTONOMOUS)

B.Tech III Year II Semester Regular Examinations July-2021

DESIGN OF MACHINE ELEMENTS-II

(Mechanical Engineering)

Time: 3 hours

Max. Marks: 60

PART-A

(Answer all the Questions 5 x 2 = 10 Marks)

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|---|---|--|----|----|
| 1 | a | State the law of belting. | L2 | 2M |
| | b | What are the bearing materials? | L1 | 2M |
| | c | Explain the term 'surge' in springs. | L1 | 2M |
| | d | List any two advantages of gear drives. | L1 | 2M |
| | e | State the design considerations for the design of crank pin. | L1 | 2M |

PART-B

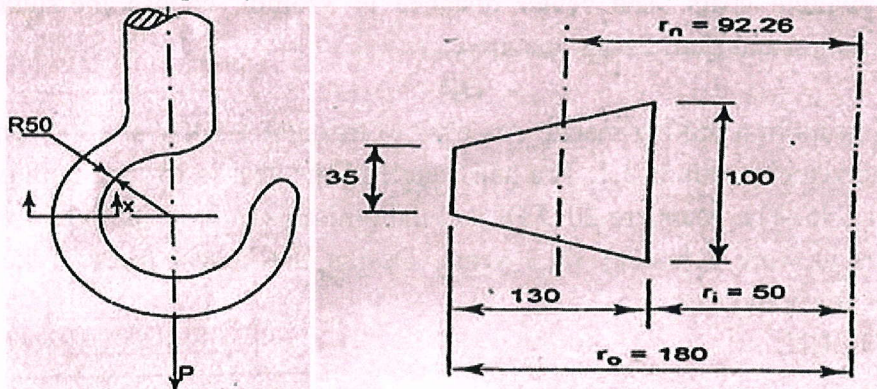
(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

- 2 An open belt connects two flat pulleys. Pulley diameters are 300 mm and 450 mm and the corresponding angles of lap are 160° and 210° , the smaller pulley runs at 200 rpm, $\mu=0.25$. It is found that the belt is on the point of slipping when 3 kW is transmitted. To increase the power transmitted two alternatives are suggested namely (i) increase the initial tension by 10% and (ii) increasing μ by 10% by the application of a suitable dressing to the belt. Which of these two methods would be more effective? Find the percentage increase in power possible in each case. L3 10M

OR

- 3 a Differentiate the straight and curved beams. L3 2M
 b A crane hook has a section, which is considered as trapezoidal as shown in fig. It is made of plain carbon steel with a yield strength of 350 MPa in tension. Determine the load capacity of the hook for a factor of safety 3. L3 8M

**UNIT-II**

- 4 Select a suitable spherical roller bearing from SKF series 222C to support a radial load of 4 kN and axial load of 2 kN. Minimum life required is 10000 hrs at 1000 rpm. For this select bearing. Find (i) the expected life under the given loads. L3 10M
 (ii) The equivalent load that can be supported with a probability of survival of 95% with 10000 hours.

OR

- 5 Following data is given for 3600 hydrodynamic bearings: journal diameter = 100 mm, radial clearance = 0.12 mm, radial load = 50 kN, bearing length = 100 mm, journal speed = 1440 rpm and viscosity of lubricant = 16 CP. Calculate (i) minimum film thickness (ii) coefficient of friction and (iii) Power lost in friction. **L3 10M**

UNIT-III

- 6 a Explain the design considerations for the big end and small end of connecting rod. **L3 5M**
 b What are the materials of the piston pin bearings and the crank pin bearings? **L3 5M**
 Explain.

OR

- 7 Design a I-section of a connecting rod for an I.C engine using the following data: **L2 10M**
 Piston diameter = 125 mm Stroke = 150 mm
 Length of connecting rod = 300 mm Gas pressure = 5 N/mm²
 Speed of engine = 1200 rpm
 Factor of safety = 5 and material is steel 35 NiCr60.

UNIT-IV

- 8 a What is the function of a spring? **L3 3M**
 b A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 84 kN/mm², find the axial load which the spring can carry and the deflection per active turn. **L3 7M**

OR

- 9 Design a close coiled helical compression spring for a service load ranging from 2250 N to 2750 N. The axial deflection of the spring for the load range is 6 mm. Assume a spring index of 5. The permissible shear stress intensity is 420 MPa and modulus of rigidity, $G = 84 \text{ kN/mm}^2$. **L3 10M**

UNIT-V

- 10 A compressor running at 300 rpm is driven by 15 kW, 1200-rpm motor through 20° full depth involute gears. The center distance is 375 mm. choose the suitable materials for the pinion and gear, design the drive. **L2 10M**

OR

- 11 A pair of helical gears in a milling machine is used to transmit 4.5 kW at 1000 rpm of the pinion and the velocity ratio is 3:1. The helix angle of the gear is 15° and both gears are made of steel C45. The gears are 20° FDI and the pinion is to have minimum of 20 teeth. The gear is to work 8 hrs/day for 3 years. Design the helical gears. Take the required hardness for both gears is more than 350 BHN. **L1 10M**

END