

Code No: 156AQ

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JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, August - 2022

DESIGN OF MACHINE MEMBERS - II

(Mechanical Engineering)

Time: 3 Hours

Max.Marks:75

Answer any five questions  
All questions carry equal marks

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1.a) Enumerate the factors that influence most the formation and maintenance of the thick oil film in hydrodynamic bearings?

b) A  $360^\circ$  hydrodynamic bearing operates under the following conditions:

radial load = 50 kN journal diameter = 150 mm bearing length = 150 mm radial clearance = 0.15 mm minimum film thickness = 0.03 mm viscosity of lubricant = 8 cP. What is the minimum speed of operation for the journal to work under hydrodynamic conditions? [5+10]

2. Design a journal bearing for a centrifugal pump running at 1440 rpm. The diameter of the journal is 100 mm and load on each bearing is 20 kN. The factor  $ZN/p$  may be taken as 28 for centrifugal pump bearings. The bearing is running at  $75^\circ\text{C}$  temperature and the atmosphere temperature is  $30^\circ\text{C}$ . The energy dissipation coefficient is  $875 \text{ W/m}^2/^\circ\text{C}$ . Take diametric clearance as 0.1 mm. [15]

3.a) What is the criterion for static load carrying capacity of ball bearing?

b) How do you express the life of a bearing? What is an average or median life? [7+8]

4. A ball bearing subjected to a radial load of 3000 N is expected to have a satisfactory life of 10000 h at 720 rpm with a reliability of 95%. Calculate the dynamic load carrying capacity of the bearing, so that it can be selected from a manufacturer's catalogue based on 90% reliability. If there are four such bearings, each with a reliability of 95% in a system, what is the reliability of the complete system? [15]

5. Design a cast iron piston for a single acting four-stroke diesel engine with the following data: Cylinder bore = 300 mm, Length of stroke = 450 mm, Speed = 300 rpm, Indicated mean effective pressure = 0.85 MPa, Maximum gas pressure = 5 MPa, Fuel consumption = 0.30 kg per BP per h, Higher calorific value of fuel = 44 000 kJ/kg. Assume suitable data if required and state the assumptions you make. [15]

6.a) What is the manufacturing method for connecting rod? Why I cross-section is preferred for designing connecting rod?

b) Explain the various stresses induced in the connecting rod. [10+5]

7.a) What is the Wahl factor? Why is it used?

b) Is required to design a V-belt drive to connect a 7.5 kW, 1440 rpm induction motor to a fan, running at approximately 480 rpm, for a service of 24 h per day. Space is available for a centre distance of about 1 m. [5+10]

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8.a) Write the expressions for static, limiting wear load and dynamic load for spur gears and explain the various terms used there in ?

AG b) A pair of spur gears consists of a 20 teeth pinion meshing with a 120 teeth gear. The module is 4 mm. Calculate (i) the centre distance; (ii) the pitch circle diameters of the pinion and the gear; (iii) the addendum and dedendum; (iv) the tooth thickness; (v) the bottom clearance; and (vi) the gear ratio. [7+8]

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