

R09

Code: 9A03605

B.Tech III Year II Semester (R09) Supplementary Examinations December/January 2015/2016

DESIGN OF MACHINE ELEMENTS – II

(Mechanical Engineering)

Time: 3 hours

Max Marks: 70

Answer any FIVE questions

All questions carry equal marks

Use of design data books is permitted in the examination hall

- 1 A 0.01 m diameter shaft operating at 2000 rpm is supported by means of a 0.15 m long journal bearing which is supporting radial load of 45 kN. The oil temperature is to be limited to 60°C, the surrounding air temperature is 38°C. Assume $Zn/p = 28$. Determine: (i) Co-efficient of friction. (ii) Bearing pressure. (iii) Heat generated. (iv) Heat dissipated. (v) Oil to be used. (f) Is artificial cooling required?
- 2 (a) Enumerate the qualities of a good cylinder liners.
(b) What is the function of piston? Explain piston troubles.
- 3 (a) Explain why torsional vibrations are dangerous.
(b) Explain reasons for the failure of a crank shaft.
- 4 The section is a rectangular 6 cm × 4 cm. The centre of curvature of the section is at distance of 8 cm from the centroid of the section. A load of 15 kN is acting through the centre of curvature. Determine the maximum and minimum stresses in the hook.
- 5 A flat open belt horizontal drive is to transmit 15 kW at 1440 r.p.m. The motor shaft carries the driving pulley of 300 mm diameter, while driven pulley is 1000 mm in diameter. Take belt thickness = 10 mm, density of belt material = 1000 kg/m³, maximum permissible stress = 3 MPa, center distance = 3 m and coefficient of friction = 0.3. Find the width of the belt.
- 6 A pair of helical gears is to transmit 25 kW. The teeth are 20° stub in diametral plane and have a helix angle of 45°. The pinion runs at 10000 r.p.m. and has 80 mm pitch diameter. The gear has 320 mm pitch diameter. If the gears are made of cast steel having allowable static strength of 100 MPa; determine a suitable module and face width from static strength considerations and check the gears for wear, given $\sigma_{es} = 600$ MPa.
- 7 A semi-elliptical laminated vehicle spring to carry a load of 6000 N is to consist of seven leaves 65 mm wide, two of the leaves extending the full length of the spring. The spring is to be 1.1 m in length and attached to the axle by two U-bolts 80 mm apart. The bolts hold the central portion of the spring so rigidly that they may be considered equivalent to a band having a width equal to the distance between the bolts. Assume a design stress for spring material as 350 MPa. Determine: (i) Thickness of leaves. (ii) Deflection of spring. (iii) Diameter of eye. (iv) Length of leaves. (v) Radius to which leaves should be initially bent.
- 8 (a) Explain with a neat sketch the working principle of recirculating ball screw.
(b) Explain briefly the advantages and disadvantages of recirculating ball screw over power screws
