

22564

23242

4 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
(2) Answer each next main Question on a new page.
(3) Illustrate your answers with neat sketches wherever necessary.
(4) Figures to the right indicate full marks.
(5) Assume suitable data, if necessary.
(6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following:** **10**
- a) Define Machine Design.
 - b) State materials used for helical spring.
 - c) State two applications of Knuckle Joint.
 - d) Define shaft coupling.
 - e) Write applications of power screw.
 - f) Write important functions of springs.
 - g) Classify bearing.
2. **Attempt any THREE of the following:** **12**
- a) Explain steps involved in general design procedure.
 - b) Explain the purpose of turn buckle. State its application.
 - c) What are the advantages and disadvantages of muff coupling.
 - d) Explain steps involved in general design procedure.

P.T.O.

3. Attempt any THREE of the following: 12

- a) Write any four ergonomics considerations which makes the job comfortable.
- b) Explain following terms :
 - i) Major diameter
 - ii) Minor diameter
 - iii) Pitch
 - iv) Crest
- c) Explain with neat sketch construction details of leaf spring.
- d) Describe stress concentration. Explain any four methods to reduce it with neat sketch.
- e) Compare welded joints with screwed joints.

4. Attempt any TWO of the following: 12

- a) Draw stress-strain diagram for Ductile Material and Brittle Material.
- b) Draw neat sketch of cotter joint and give their applications.
- c) Find the diameter of a solid shaft to transmit 35 kw at 230 rpm. The ultimate shear stress for the steel may be taken as 420 Mpa and factor of safety as 6. If a hollow shaft is to be used in place of the solid shaft find inside and outside diameter when the ratio of inside to outside.

5. Attempt any TWO of the following: 12

- a) A flange coupling is used to transmit 20 kw power at 700 rpm. The flanges are of cast iron and other parts are mild steel. Determine diameter of shaft, diameter of bolts assuming number of bolts are 6 and flange dimension. Take
 - i) Shear stress for mild steel = 45 N/mm^2
 - ii) Shear stress for cast iron = 40 N/mm^2
 - iii) Tensile and Crushing stress = 100 N/mm^2

- b) A vertical double start square threaded screw of 120 mm mean diameter and 24 mm pitch supports a vertical load of 20 kN. The axial thrust in screw is taken by collar bearings of 300 mm outside and 150 mm inside diameter. Find the force required at the end of the lever which is 400 mm long in order to lift and lower the load. The coefficient of friction for screw and nut is 0.18 and for collar bearing it.
- c) Write the steps involved in selection of proper ball bearing from manufacturer's catalogue.

6. Attempt any TWO of the following:

12

- a) A plate 75 mm wide and 12.5 mm thick is to be joined with another plate by single transverse and parallel fillet weld, Maximum tensile and shear stresses are 70 N/mm^2 and 56 N/mm^2 respectively Find the length of each parallel fillet weld if joint is subjected to 90 kN.
- b) A helical spring is made from a wire of 8 mm diameter and has outside diameter 90 mm, if the permissible shear stress is 350 N/mm^2 and modulus of rigidity 84 kN/mm^2 , find the axial load which the spring can carry and the deflection per active turn.
- i) Neglecting the effect of curvature.
- ii) Considering the effect of curvature.
- c) A hollow shaft is to be designed to transmit 600 kw at 110 rpm. The maximum torque being 20% greater than the mean. The shear stress is not to exceed 63 Mpa and angle of twist in a length of 3 m not to exceed 1.4° . Find external diameter of the shaft if the internal diameter to external diameter is $3/8$. Take modulus of rigidity. 84 GPa.
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