TIME-3HOUR
MARK-60

Note: Section A Is Compulsory. Attempt Any Four Questions From Section B And Any Two From Section C.

SECTION A MARKS 2 EACH

1. (a) Mention the various Machine Design Processes. Explain any on of them in brief.

(b) What does Product Design mean? Explain in brief.

(c) State at least two practical applications each of welded and riveted joints.

(d) Explain the difference between rigid and flexible couplings. Mention at least one practical application of each type.

(e) Name any four pipe fittings. Sketch any one of these.

(f) Name any three types of pipe joints and draw any one of these.

(g) Explain the Aesthetics design criterion.

(h) Explain the importance of Ergonomics in design.

(i) Explain the term Fatigue strength. Name two practical applications of fatigue.

(j) Draw a spigot and socket joint and mention very clearly its material of construction.

SECTION B MARKS 5 EACH

2. Mention various steps required in designing a welded pipe joint.

3. List various considerations incorporated in the term 'Factor of safety'.

4. A splined connection consists of 6 splines cut in 70 mm diameter shaft. The height of each spline is 4 mm and the keyway hubs are 40 mm long. Determine the power that the spline can safely transmit at 3000 r.p.m., if the allowable pressure is not to exceed 15 N/mm2.

5. A propeller shaft of a car is in the form of a hollow shaft having 45 mm outer diameter and 2 mm thickness. Calculate the maximum shear stress in the shaft if it transmits 20 kW at 2800 r.p.m.

6. Explain the following:

(a) Design of shaft for critical speed

(b) Design procedure for a stepped machine shaft.

SECTION C MARKS 10 EACH

7. An eccentrically loaded bolted joint as shown in Fig. 1 is to be designed. All the bolts are to be of the same size. Determine the size of the bolts, if the permissible shear strength of the bolts is 50MPa.

8. A double riveted lap joint is to be made between 9.5 mm plates. If the safe working stresses in tension is 80 N/mm2, in shear 60 N/mm2 and in crushing as 120 N/mm2, calculate the rivet pitch, and the distance between the rows of rivets. State how the joint will fail.

9. Design a knuckle joint to withstand a tensile force of 25 kN. The material of the joint has a tensile strength of 300 N/mm2. Assume a factor of safety of 5.