

17553

15116

4 Hours / 100 Marks

Seat No.

--	--	--	--	--	--	--	--

- Instructions :**
- (1) All Questions are *compulsory*.
  - (2) Illustrate your answers with neat sketches wherever necessary.
  - (3) Figures to the right indicate full marks.
  - (4) Assume suitable data, if necessary.
  - (5) Use of Non-Programmable Electronic Pocket Calculator is permissible.
  - (6) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.
  - (7) Use of steam tables, logarithmic, Mollier's chart is permitted.

**Marks**

**1. Attempt any FIVE :**

**5 × 4 = 20**

- (a) Explain the maximum normal stress theory and its considerations.
- (b) Explain effect of keyway on strength of shaft.
- (c) Draw four types of welded joints and state their specific applications.
- (d) Describe the terminology used in riveted joints.
- (e) Describe following screw threads :
  - (i) British standard thread
  - (ii) Acme threads
  - (iii) Metric threads
  - (iv) British Association
- (f) Explain any two stresses to be considered while designing pipes and pipe joints.
- (g) Explain stress-strain diagram for :
  - (1) Mild steel
  - (2) Cast iron
- (h) State advantages and disadvantages of welded joints.

**P.T.O.**

**2. Attempt any TWO :****2 × 8 = 16**

- (a) Describe the following :
  - (i) Factor of safety and its selection.
  - (ii) Stress concentration and its remedies.
- (b) Two shafts are connected with the help of cast iron protective type flange coupling to transmit 8 kW at 750 rpm. The permissible stresses are as under shear stress for shaft bolt and key material is  $35 \text{ N/mm}^2$ , crushing stress for bolt and key material is  $60 \text{ N/mm}^2$  and shear stress for cast iron is  $15 \text{ N/mm}^2$ . Find the diameter of shaft and design the coupling.
- (c) Explain procedure in machine design. Which are general considerations in machine design ?

**3. Attempt any TWO :****2 × 8 = 16**

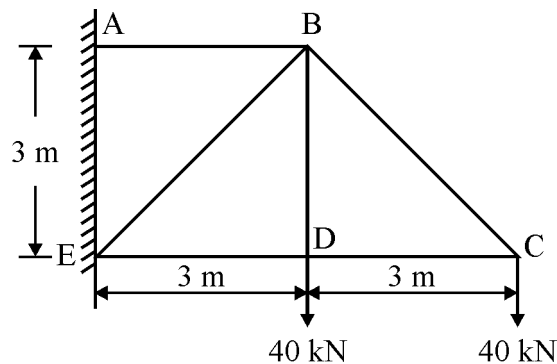
- (a) Determine the diameter of hollow shaft with a ratio of inner diameter to outer diameter 0.8, capable of transmitting 400 kW at 225 rev/min. When subjected to a maximum bending moment of 5000 Nm. The load is suddenly applied with minor shocks for torsional moment, the bending moment is steady and allowable shearing stress 50 MPa.
- (b) Explain in detail design procedure of sunk key. Write various strength equations.
- (c) A plate 75 mm wide and 10 mm thick is joined with another steel plate by means of single transverse and double parallel fillet weld. The permissible tensile and shear stress in weld are 70 MPa and 50 MPa respectively. Find the length of each parallel fillet if the joint is subjected to static load of 55 kN.

**4. Attempt any TWO :****2 × 8 = 16**

- (a) Explain the design procedure for a circumferential lap joint for a boiler.
- (b) Describe the procedure for designing an axially loaded unsymmetrical welded section with neat sketch.
- (c) A steam boiler is to be design for a working pressure of  $2.5 \text{ N/mm}^2$  with its inside diameter 1.6 m give the design calculation for circumferential joint for the following working stress for steel, plates and rivets as, in Tension = 75 MPa, Shear = 60 Mpa, Crushing = 125 MPa.

**5. Attempt any TWO :****2 × 8 = 16**

- (a) Explain the design procedure for bolting cylinder cover of a pressure vessel.
- (b) Explain detail design procedure for circular flanged pipe joint.
- (c) Find the forces in all members of the truss shown in fig. Use method of joints.
- Tabulate the results.

**6. Attempt any TWO :****2 × 8 = 16**

- (a) (i) Bolts of uniform strength  
(ii) Types of shaft and shaft materials.
- (b) When method of sections is preferred over method of joints ? Explain method of sections with suitable example, which is used for analysis of framed structure.
- (c) Determine the forces in all members of the following trusses show in fig.

