

# 17457

**16172**

**3 Hours / 100 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 answer with neat sketches wherever necessary.
  - (4) Figures to the right indicate full marks.
  - (5) Assume suitable data, if necessary.
  - (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
  - (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

**Marks**

- 1. Attempt any FIVE of the following: **20****
- a) Define pressure vessels. How they are classified?
  - b) Find dilation of cylindrical vessel if its internal pressure is  $1.5 \text{ N/mm}^2$ , thickness is 20 mm and diameter 3 m. Take Poisson's ratio as 0.3 and modulus of elasticity,  $E = 2 \times 10^5 \text{ N/mm}^2$ .
  - c) Explain the three types of protective coatings for pressure vessels.
  - d) Write general design criterion for pressure vessel.

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**Marks**

- e) How pressure vessel material is selected for hydrogen service?  
Give examples.
- f) Explain discontinuity stresses with sketches.
- g) Sketch any four welded joints used in pressure vessels. State advantages of welded joints.

**2. Attempt any TWO of the following:**

**16**

- a) Design a cylindrical pressure vessel for the following parameters-

Operating pressure = 0.40 MPa

Ultimate strength = 390 N/mm<sup>2</sup>

Joint efficiency = 85%

Factor of safety = 3

I.D. of vessel = 1.2 m

Corrosion allowance = 2 mm

Weight of vessel with fluid = 35 kN

Compressive stress for bolts = 56 MPa

I.D. of nozzle = 150 mm

- b) Explain the effect of wind load and earthquake loads on design of pressure vessel.
- c) Draw a neat sketch of pressure vessel and give terminology in detail.

- 3. Attempt any TWO of the following:** **16**
- a) Explain stress concentrations in circular and elliptical openings for pressure vessels with neat sketches.
  - b) A cylindrical shell is subjected to an operating pressure of 2 MPa. If internal diameter of shell is 3.5 m. and maximum allowable stress is 160 MPa, Calculate -
    - (i) Thickness of shell
    - (ii) Thickness of conical head, if apex angle of cone is  $60^\circ$ . Take joint efficiency as 85% and corrosion
  - c) Explain any four defects in welds for pressure vessels. Explain any one NDT method for welds.
- 4. Attempt any TWO of the following:** **16**
- a) List standard accessories and mountings for pressure vessels. Explain one each from above.
  - b) Write factors considered for placement and shape of nozzle. Explain nozzle reinforcement with sketch.
  - c) Explain stress concentration and fatigue connection. How these can be minimized? Explain with sketches.
- 5. Attempt any TWO of the following:** **16**
- a) Draw neat sketch of flanged joint. Write stresses acting on its different sections. Classify gaskets with their specific area of applications.
  - b) Draw and explain support skirts, support lugs, saddles and stiffeners.
  - c) Explain in brief -
    - (i) Ultra high pressure vessel
    - (ii) Membrane stress

**6. Attempt any FOUR of the following:****16**

- a) Explain staked plates and built up plates.
  - b) 6 holes of 100 mm diameter each are drilled keeping them 480 mm apart. Permissible stress for vessel material is 130 MPa. Find :
    - (i) Ligament efficiency
    - (ii) Stresses in ligament
  - c) Explain stresses in bimetallic joints with neat sketches.
  - d) What is the design approach for bolted joints? List the bolting material with applications.
  - e) Describe any four materials used for construction of vessel for Non-corrosive service.
  - f) Explain use of aluminium alloys and stainless steel in pressure vessels.
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