

17457

21314

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 answers 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) What is the pressure vessel ? How are pressure vessel classified ?
 - b) Define-
 - i) Wind load
 - ii) piping load
 - c) What are the general design criterion of pressure vessel?
 - d) Draw a neat labeled sketch of -
 - i) Semi-ellipsoial head
 - iii) Torispherical head

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- e) Define -
 - i) Dilation efficiency
 - ii) Ligament efficiency
- f) What is stress concentration? How does it occurs?
- g) Draw welding symbols of following -
 - i) Spot weld
 - ii) Plug weld
 - iii) Steam weld
 - iv) Stud

2. Attempt any TWO of the following:

16

- a) State and explain accessories and mountings used in pressure vessels.
- b) A cast steel cylinder of 350mm inside diameter is to store certain liquid at a pressure of 13.5 N/mm^2 . It is closed at both ends by flat cover plate which are made of alloy steel and are attached by bolts.
 - i) Determine the wall thickness of the cylinder if the maximum hoop stress in the material is limited to 55MPa.
 - ii) Calculate the minimum thickness necessary of the cover plates if the working stress is not to exceed 65 MPa.
- c) A pressure vessel consists of a cylinder of a meter inside diameter and is closed by hemispherical ends. The pressure intensity of the fluid inside the vessel is not to exceed 2 N/mm^2 . The material of the vessel is steel, whose ultimate strength in tension is 420 MPa. Calculate the required wall thickness of the cylinder and the thickness of the hemispherical ends, considering a factor of safety of 6. Neglect localised effects at the junction of the cylinder and the hemisphere.

- 3. Attempt any TWO of the following:** **16**
- a) State and explain the different stresses included in ring and sphere.
 - b) Explain the design procedure of nozzles and flanges used in pressure vessels.
 - c) Define fatigue concentration. Explain stress concentration in circular and elliptical opening.
- 4. Attempt any TWO of the following:** **16**
- a) State and explain defects in welds?
 - b) Suggest a suitable ferrous and non ferrous materials used for corrosive service. Explain method of attaching protective layers.
 - c) What is nozzle reinforcement ? Explain its replacement procedure and shape.
- 5. Attempt any TWO of the following:** **16**
- a) What are the factors to be considered while determining earthquake loads? Compare the stress distribution in a thin and thick walled pressure vessels.
 - b) Draw and explain following parts of pre vessels
 - i) Support skirts
 - ii) Support lugs
 - iii) Saddles
 - iv) Stifners
 - c) What are the steps to be considered in selection of material for hydrogen service.

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

- a) Define the terminology used in pressure vessels.
 - b) A seamless spherical shell, 900mm in diameter and 10mm thick is being filled with a fluid under pressure until its volume increases by $150 \times 10^3 \text{ mm}^3$. Calculate the pressure exerted by the fluid on the shell, taking modulus of elasticity for the material of the shell as 200 kn/mm^2 and Poisson's ratio as 0.3.
 - c) How pressure vessel is designed for bolt size and numbers?
 - d) What are the causes of stress concentration? State the remedies to avoid it.
 - e) Explain NDT of welds.
 - f) A cast iron cylinder of inside diameter 160 mm in subjected to a pressure of 15 N/mm^2 . The permissible working stress for the cast iron may be taken as 25 MPa. If the cylinder is closed by a flat head cast integral with the cylinder walls, Find the thickness of the cylinder wall and the flat head.
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