

(33)

N.B.

(4 hours)

Maximum marks: 80

1. Question No.1 is compulsory.
2. Attempt any three out of remaining five questions.
3. Assume any suitable data if necessary and indicate it clearly.
4. Figures to the right indicate marks.
5. Illustrate answers with sketches wherever required.

i. Write short notes on any four.

- a) Design stress and factor of safety.
- b) Heating systems in a chemical reaction vessel.
- c) Code and standards.
- d) Various types of agitators and their applications.
- e) Selection, type and design of gaskets.

2. a) Write a design procedure for agitator vessel. Include
 - (i) Agitator shaft
 - (ii) Blade assembly
 - (iii) Stuffing box

b) Draw a proportionate drawing of stuffing box.

3. a) Design the flanged joint for a cylindrical pressure vessel for the following data: 14

Design Pressure = 0.5 N/mm^2
 Shell outside diameter = 1000 mm
 Shell inside diameter = 988 mm
 Bolt Material = Hot rolled carbon steel

Allowable stress for bolt material:

At Atmospheric condition = 57 N/mm^2 At Operating condition = 53 N/mm^2 Allowable stress for flange material (carbon steel) = 95 N/mm^2 Gasket material (asbestos composition) of 3.2 mm thickness with gasket factor = 2Minimum gasket design seating stress = 11 N/mm^2

Design should include:

(i) Design of gasket

(ii) Design of bolt

(iii) Design of Flange

- b) Draw different types of Heads with necessary equation to calculate its thickness. 6

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4. a) A cylindrical storage tank with conical roof has the following data:

Tank Diameter	= 12 m
Tank height	= 12 m
Material of construction	= Steel (IS: 2041)
Permissible stress	= 140 N/mm^2
Density	= 7.7 gm/cc
Modulus of elasticity	= $2 \times 10^5 \text{ N/mm}^2$
Corrosion Allowance	= 1.5mm
Sp. Gravity of liquid	= 1
Superimposed Load	= 1225 N/m^2
Slope angle	= 1:5

Butt weld joints with 3 mm allowance to attach the shell plates.

Number of plates = 06

Design should include:

- Size and arrangement of shell plates
- Design of conical roof
- Bottom Design

b) Draw to a recommended scale:

- Storage tank (sectional F.V)
- Arrangement of shell and plates
- Bottom Details

5 a) Describe the design procedure for reaction vessel with i) Plain jacket ii) Half coil jacket. 10

b) Describe the design procedure for a pair of saddle support for a horizontal vessel giving the formulas used. The design must include longitudinal moments and stresses in the shell. 10

6. Write short notes on any four.

- Significance of design stress, design pressure, and design temperature.
- Stress concentration at openings in vessels.
- Electric Arc welding.
- Inspection of vessel by radiography.
- Bracket supports.

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06

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