

(3 Hours)

[Total Marks: 80]

1. Question one is compulsory
2. Attempt any three from Q.2 to Q.6
3. Assume data wherever necessary
4. Figure to the right indicate full marks.

- Q.1 Attempt any four of the following 20
- a) Write a note on design of rectangular tank..
  - b) State the procedure for spherical shell subjected to an external pressure.
  - c) Draw a neat sketch of Pressure vessel showing all the welded category joints.
  - d) Write a note agitator and its application.
  - e) Write a note on limphet coil jacket
- Q.2 a) Calculate the thickness of ellipsoidal head (2:1) for following design data input. 12
- Material of construction – SA 515 gr 70  
 Design Temperature – 400°C.  
 Design Pressure – 20 bar  
 Inside diameter – 2000 mm  
 Height – 3000 mm  
 Corrosion allowance – 1.5 mm  
 Radiography – Full  
 Allowable stress – 101 Mpa  
 Design code – ASME Section VIII, Div 1
- a) Explain with reference to pressure vessels 8
- i. Corrosion allowance
  - ii. Welded joint efficiency
- Q.3 a) Explain ASME section VIII DIV 1. 10
- b) Write a note on Design of skirt support. 10
- Q.4 a) A propeller operating at 350 rpm speed in a vessel of 1200 mm diameter with 12
- following data: Design shaft based on equivalent bending and critical speed.
- |                                      |                       |
|--------------------------------------|-----------------------|
| Internal pressure in a vessel        | 0.3 N/mm <sup>2</sup> |
| Specific gravity of liquid in vessel | 1.1                   |
| Diameter of agitator                 | 300 mm                |

Power number	0.9
Overhang of shaft from bearing support	1500 mm
Shaft material	Steel
Permissible shear stress	50 N/mm <sup>2</sup>
Elastic limit in tension	250 N/mm <sup>2</sup>
Modulus of elasticity	$2 \times 10^5$ N/mm <sup>2</sup>

b) State the various types of baffles used in agitator and draw a neat sketch of each. 8

Q.5 a) A cylindrical storage tank with open top has following data. 10

Tank diameter	20 m
Tank height	12 m
Density of liquid	1000 kg/m <sup>3</sup>
Permissible stress	165 N/mm <sup>2</sup>
Modulus of elasticity	$2 \times 10^5$ N/mm <sup>2</sup>
Corrosion allowance	2 mm
Material of construction	Carbon steel
Density of MOC	7850 kg/m <sup>3</sup>

Design

- i. Shell plate thickness at various height.
- ii. Wind girder

b) Discuss with reference to vessel support 10

1. Base plate,
2. Skirt bearing plate

Q.6 Attempt any four 20

- a) State the types of opening used in pressure vessel and explain any one.
- b) Classify agitator
- c) Draw shell and tube heat exchanger showing all the components..
- d) Write a note on gasket selection and design.
- e) Explain Process Data Sheet and PID