

Date: 20/5/19

(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) State all types' vessel support with their application and neat sketch.
 - b) State the procedure for spherical shell subjected to an external pressure.
 - c) State brief reasons for loss of fluid in storage tanks.
 - d) Classify heat exchanger as per TEMA.
 - e) Write a note on design consideration of process equipment design.
- Q.2 a) Explain following aspects of design of shell and tube heat exchanger – Shell diameter, Shell thickness, Nozzle thickness, Channel and Channel. 12
- b) Explain with reference to pressure vessels 8
- i. Welded joint efficiency factor
 - ii. Corrosion allowance
- Q.3 a) Write a note on ASME boiler pressure vessel sections. 12
- b) Draw a neat sketch of pressure vessel showing all the categories of joint as per ASME. 8
- Q.4 a) A propeller operating at 350 rpm speed in a vessel of 1200 mm diameter with following data: Design shaft based on equivalent bending and critical speed. 12
- | | |
|----------------------------------------|-----------------------------------|
| Internal pressure in a vessel | 0.3 N/mm ² |
| 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 ² |
| Elastic limit in tension | 250 N/mm ² |
| Modulus of elasticity | 2×10^5 N/mm ² |
- b) Draw a neat sketch of reinforced openings showing all the areas as per ASME code. 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 ³ |
| Permissible stress | 165 N/mm ² |
| Modulus of elasticity | 2 x 10 ⁵ N/mm ² |
| Corrosion allowance | 2 mm |
| Material of construction | Carbon steel |
| Density of MOC | 7850 kg/m ³ |
- Design
- i. Shell plate thickness at various height.
 - ii. Wind girder
- b) Write a note on (any two). 10
1. Radiographic test
 2. Standard hydrostatic test
 3. Standard pneumatic test
- Q.6 Attempt any four 20
- a) Floating roof type storage tank
 - b) Power requirements for agitation
 - c) Explain tube pattern in relation with heat exchanger.
 - d) Describe procedure of rectangular tank.
 - e) Explain P and ID and PFD