

[Time: Three Hours]

[ Marks:80]

- N.B.
- 1 Question **ONE** is compulsory
  - 2 Attempt any **THREE** questions out of the remaining
  - 3 Figure to the right indicate full marks
  - 4 Illustrate answers with sketches wherever required and Diagram at appropriate places carries marks
  - 5 Assume suitable data if necessary and indicate it clearly.

1 Write short notes on any **four**. (20)

- (a) Codes and Standards.
- (b) Thermal Stresses.
- (c) Design Pressure and Design Temperature.
- (d) Saddle Supports for Horizontal Vessel.
- (e) Metal Joining Technique.

2 (a) Design a pressure vessel for the following specifications: (14)

i) Shell

Internal Diameter = 1200 mm  
Material = Stainless steel (SS 304)  
Permissible stress for SS at 150<sup>0</sup> C = 130 N/mm<sup>2</sup>  
Design pressure = 0.6 N/mm<sup>2</sup>

ii) Head (Standard Torispherical)

Crown Radius = 1200 mm  
Knuckle radius = 6 % of Crown radius  
Material = Stainless steel (SS 304)

iii) Flange, Gasket and bolt data:

Gasket factor = 2.0  
Minimum design gasket seating stress = 11.2 N/mm<sup>2</sup>  
Flange material = asbestos  
Permissible stress for bolt material = 55 N/mm<sup>2</sup>

Design should consist of the following:

i) Shell ii) Head and iii) Flanges with gasket and bolt.

(b) Draw the different formed heads. (06)

- 3 (a) A cylindrical storage tank with conical roof and flat bottom has following (14)  
data:  
Tank Diameter = 24 m  
Tank Height = 16 m  
Material of construction = Steel ( IS : 2041)  
Density of Liquid = 0.001 kg/cm<sup>3</sup>  
Density of material = 7.7 gm/cc  
Superimposed load = 1225 N/m<sup>2</sup>  
Permissible stress = 140 N/mm<sup>2</sup>  
Design: 1. Shell plate thickness at various height  
2. Conical roof
- (b) Draw the different flange faces. (06)
- 4 (a) Write a design procedure for Agitation vessel which includes: (i) Shaft (12)  
subjected to twisting moment only, (ii) Shaft subjected to bending moment  
only, and (iii) shaft based on critical speed.
- (b) Write a design procedure for stuffing box and gland. (08)
- 5 (a) Describe the design procedure for reaction vessel with- (14)  
1. Plain Jacket  
2. Dimple Jacket  
3. Half Coil Jacket
- (b) Estimate the optimum pipe diameter for a water flowrate of 14 Kg/sec (06)  
at 20°C. Carbon steel pipe is used. Density of water is 1000 Kg/m<sup>3</sup> and  
viscosity of water is at 20°C is 1.1 x 10<sup>-3</sup> Ns/m<sup>2</sup>. Also find whether flow is  
laminar or turbulent.
- 6 Write short notes on any four. (20)
- (a) Essential accessories of floating roof tank.  
(b) Losses in storage of volatile liquids.  
(c) Skirt Bearing plate.  
(d) Radiographic examination.  
(e) Design Procedure of skirt support considering stresses due to wind load.