

SE. Sem - IV (Chem.)

10/6/14

SE (Chem) - Sem IV (CBGS) - MED

3.00 to 7.00 p.m

Mechanical Equipment Design
QP Code : NP-19848

(1)

(35)

(4 Hours)

[Total Marks : 80

- N.B. : (1) Question No. 1. is compulsory.
(2) Attempt any three questions out of remaining five questions.
(3) Assume any suitable data wherever required.
(4) Assumptions made should be clearly stated.
(5) Illustrate answers with sketches wherever required,

1. Write short notes on any four. 20
- (a) Different types of heads.
 - (b) Various theories of failure.
 - (c) Inspection of vessel by radiography.
 - (d) Saddle supports
 - (e) Different types of jackets for reaction vessels.
2. (a) Describe the design procedure for a vertical cylindrical pressure vessel under internal pressure. Design should include: 14
- (i) Shell
 - (ii) Head
 - (iii) Flanged joint
 - (iv) Nozzle
- (b) Draw proportionate diagram of above mentioned pressure vessel. Show 6
- (i) Front view
 - (ii) Flanged joint
3. (a) Following data refer to a storage vessel. 16
- Design a fixed conical roof cylindrical tank with the help of following data.
- | | | |
|---|---|---------------------------------------|
| Diameter of vessel | = | 18 m |
| Height of vessel | = | 10 m |
| Specific gravity of liquid to be stored | = | 0.85 |
| Size of manhole | = | 850 mm |
| Size of inlet and outlet nozzle | = | 100 mm |
| Material of construction | = | Carbon steel |
| Permissible stress in the material | = | 120 N/mm ² |
| Modulus of elasticity | = | 2 x 10 ⁵ N/mm ² |
| Specific gravity of material | = | 7.7 |
| Size of plate sailable | = | 5650 mm x 1600 mm |
| Superimposed load | = | 1250 N/m ² |
- Design
- (i) The sizes and layout of shell plates.
 - (ii) The sizes and arrangement of sketch plates and annular plates.
 - (iii) Conical roof.

2.

QP Code : NP-19848

(2)

- (b) Draw to a recommended scale a sectional front view of the storage vessel that you have designed showing the assembly of roof and fittings. 4
4. Design an agitator in a standard tank configurations as described follows: 16
- Vessel diameter = 1500 mm
 Internal pressure = 0.5 N/mm²
 Diameter of an agitator (impeller) = 500 mm
 Speed of agitation = 200 rpm
 Liquid in vessel : Specific gravity = 1.2
 Viscosity = 600 cp
 Overhang of agitator shaft between bottom bearing and agitator = 1300 mm
 Agitator blades (flat) = 6
 Width of the blade = 75 mm
 Thickness of the blade = 8 mm
 Baffles = 4
 Permissible stress in shaft = 55 N/mm²
 Elastic limit in tension (yield stress) = 246 N/mm²
 Modulus of elasticity = 195000 N/mm²
 Permissible stresses in key
 Shear stresses = 65 N/mm²
 Crushing stresses = 130 N/mm²
 Shaft material = cold rolled steel
 Stuffing box = C.S.
 Permissible stress = 95 N/mm²
 Studs and bolts = Hot rolled C.S.
 Permissible stress = 58.7 N/mm²
 Use Power number = 4.5
- Design should include,
- Shaft
 - Blade, Hub and Key design
 - Stuffing box and gland
- (b) Prepare dimensional drawing of stuffing box assembly. 4
5. (a) Write a design procedure for skirt support. 14
 (b) Draw above mentioned support details. 6
6. Write a design procedure for reaction vessel and draw different types of jackets. 20