

~~Solid Fluid Mechanical Operations~~

(4 hours)

Maximum marks: 80

(31)

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. Draw figures wherever needed.

1. Write short notes on any four. 20
 - a) Selection and various types of gasket.
 - b) Design stress and factor of safety.
 - c) Standards, codes & their significance.
 - d) Different types of roofs used for storage vessels
 - e) Inspection of equipments.

2. a) Describe design procedure of a flanged joint. 10

b) Design the thickness of a cylindrical shell subjected to an internal pressure of 0.5 N/mm^2 . Also check the resultant stress in the shell for safety with the following data. 10
Permissible stress of the material used = 140 N/mm^2
Internal diameter of the vessel = 1500 mm
Spot radiographically tested double welded butt joint ($J = 0.85$)
Total weight of the vessel and its content = 40 kN
Torque due to offset piping in the shell = 1500 Nm

3. a) Design a fixed conical roof cylindrical tank with the help of following data. 16
Design should include,
 - i) Shell
 - ii) Tank bottom
 - iii) Self supporting conical roofTank diameter (inside) = 20 m
Tank height = 12 m
Density of liquid = 1000 kg/m^3
Superimposed load = 1250 N/m^2
Conical roof slope = 1 in 5
Material of construction = Carbon steel (structural) IS 2062
Permissible stress = 165 N/mm^2
Density of the MOC = 7850 kg/m^3
Modulus of elasticity = $2 \times 10^5 \text{ N/mm}^2$

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Corrosion allowance = 1.5 mm
Size of plate 6300 mm x 1800 mm

- b) Draw to a recommended scale a sectional front view of the storage vessel vessel that you have designed showing the assembly of roof and fittings. 4
- 4 a) Write a design procedure for jacketed chemical reaction vessel including 14
i) Shell.
ii) Jacket.
iii) Head.
- b) How baffles help during agitation? Draw different types of baffles. 6
- 5 a) Write a design procedure for bracket support. Include 14
i) Details of bracket
ii) Column supports for brackets
iii) Base plate for column support
- b) Draw above mentioned bracket support details. 6
6. Write short notes on any four. 20
a) Design of stuffing box.
b) Equipment classification.
c) Non destructive tests for process vessels.
d) Various losses in storage of volatile liquids.
e) Various types of agitators and their applications.

GN-Con.:11516-14.