

(4 hours)

Marks: 80

N.B

1. **Question No. 1** is compulsory.
2. Attempt any **three** out of remaining **four** questions.
3. Assume any suitable data if necessary and indicate it clearly.
4. Figures to the right indicate marks.
5. Illustrate answers with sketches wherever required.

1. Write short notes on any **four**. 20
 - a) Losses in storage of volatile liquids.
 - b) Gaskets and their selection.
 - c) Significance of baffles in Agitation. Draw different types of baffles.
 - d) Supports for horizontal vessel.
 - e) Classification of Pressure vessel.
2. a) Write a design procedure for pressure vessel which includes: 15
 - i) Shell ii) torispherical head iii) Flanged joint
- b) Draw the commonly used flange faces. 05
3. a) The following data refers to a 3 blade propeller operating at 575 rpm. 15

Data:

Diameter of vessel	= 500 mm
Diameter of agitator	= 150 mm
Internal pressure in vessel	= 0.4 N/mm ²
Specific gravity of liquid in vessel	= 1.4
Power number	= 1
Overhang of shaft from bearing support	= 450 m
Width of blade	= 20 mm
Thickness of blade	= 1.5 mm
Shaft material	= Steel
Permissible shear stress	= 52 N/mm ²
Elastic limit in tension	= 240
Modulus of elasticity	= 1.95 x 10 ⁵
Key material	
Permissible shear stress	= 65 N/mm ²
Permissible crushing stress	= 130 N/mm ²
Permissible stress for stuffing box	= 100
Permissible stress for bolt material	= 55

The design should include (i) Shaft (ii) Hub and key (iii) Blade
- b) Draw a proportionate drawing of stuffing box. 05

4. a) A cylindrical storage tank with conical roof and flat bottom has following data: 14
- Tank Diameter = 24 m
 - Tank Height = 16 m
 - Material of construction = Steel (IS : 2041)
 - Density of Liquid = 0.001 kg/cm³
 - Density of material = 7.7 gm/cc
 - Superimposed load = 1225 N/m²
 - Permissible stress = 140N/mm²
 - Design: 1 Shell plate thickness at various height
 - 2 Conical roof.
- b) Draw to recommended scale, the above designed storage tank. 06
5. a) Describe the design procedure for reaction vessel with- 10
- i) Plain Jacket
 - ii) Half Coil Jacket
- b) Describe the design procedure for Skirt support for a vertical cylindrical vessel. 10
6. Write short notes on any **four**. 20
- a) Standards, codes and their significance.
 - b) Various theories of failure.
 - c) Classification of reaction vessel.
 - d) Various metal forming techniques.
 - e) Supporting structures for pipelines.
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