S.E- IV Sem- Chem.
Mechanical Equipment Design.
E/chemical IV/CBSGS/Rev-2012/MED ③¹

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Q. P. Code: 26425

(4 Hours)

N.B.: (1) Question No.1 is compulsory.   Total Marks: 80
     (2) Attempt any THREE out of remaining FIVE questions.
     (3) Assume any suitable data if necessary and indicate it clearly.

1. Write short notes on **any four** of the following:-   (20)
   (a) Stress concentration at openings in vessel.
   (b) Baffles in agitation system.
   (c) Code and standards.
   (d) Significance of design pressure and design temperature.
   (e) Supports for horizontal pressure vessels.

2. (a) Design a pressure vessel for the following specification/data: (15)

  (i) Shell :

      Internal Diameter = 1200 mm   Internal pressure = 0.4 N/mm2

      Material = Stainless Steel (SS), with permissible stress at 150° = 120 N/mm²
  (ii) Head: (Standard Torispherical) Material: Same as shell

      Crown radius = 1200 mm Knuckle radius = 100 mm (iii)
Flanges: Material = Carbon steel (IS –2002)-(CS)
      Permissible stress for CS = 95 N/mm²

      Gasket = Asbestos material Gasket factor (m) = 2
      Minimum design seating stress = 11 N/mm²

  (iv) Bolts : Material = Hot rolled carbon steel
      Permissible stress at 200 °C = 54.5
      N/mm²
      Permissible stress (upto 50°C) = 59 N/mm²
The design should consists of the following:
      (i) Shell   (ii) Head and (iii) Flanges

  (b) Draw proportionate diagram of above mentioned pressure vessel, show: -   (05)
    (i) Sectional Front View   (ii)Top View

3. (a) A cylindrical storage tank with conical roof has the following data: (14)
   Tank Diameter   = 12 m   Tank height   = 12 m
   Material of construction: Steel (IS: 2041)with Permissible stress = 140 N/mm²
   Density   = 7.7 gm/cc   Modulus of elasticity = 2 x 10⁵ N/mm²
   Corrosion Allowance = 1.5mm   Sp. Gravity of liquid = 1
   Superimposed Load = 1225 N/m²   Slope angle   = 1:5

   (i)   Size and arrangement of shell plates
   (ii)   Design of conical roof
   (iii) Bottom Design

(06)

(b) Draw to a recommended scale:
   (i) Storage tank (sectional F.V)
   (ii) Arrangement of shell and plates
   (iii)Bottom Details

4. (a) Write a design procedure for agitator vessel,include   (15)
    (i)   Agitator Shaft
    (ii)   Blade Assembly
    (iii)   Stuffing Box

  (b) Draw a proportionate drawing of Stuffing Box.   (05)

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.The design must include:-
(i) Design of Skirt thickness
(ii) Design of Skirt Bearing plate
(iii) Design of Anchor Bolts   (10)

6.Write short notes on **any four** of the following:-   (20)
    (i)   Different types of flanges.
    (ii)   Types of Pressure vessel Heads
    (iii)   Radiographic testing of pressure vessels.
    (iv)   Bracket support.
    (v)   Theories of failure of component subjected to combined stresses.