

- h) Write and explain the various steps for designing of distillation column.

Section - C

Note : Attempt any two questions from this section.

(15×2=30)

3. A pressure vessel has I.D. 1470 mm and a plate thickness of 5 mm I.D. of the flange is 1482 mm, A gasket is provide over the flange face. Gasket factor is 2 and gasket seating is $y = 120\text{kg/cm}^2$. I.D. of the gasket is 1458mm. Pressure inside the vessel is 2.5 kg/cm^2 . Permissible stress in the bolt at appearing condition is 550kg/cm^2 . Diameter of bolt is 20 mm. Calculate the bolt load, bolt area, flange thickness.
4. Explain the classification of shell and tube heat exchanger and also discuss the following:
- Shell.
 - Tube
 - Baffles.
 - Pitches
 - Design pressure and temperature.
5. Write short notes on:
- Gasket.
 - Bolts.
 - Nozzles.
 - Dryers.
 - Crystallizers.
 - Design of multi effect evaporator.

(Following Paper ID and Roll No. to be filled in your Answer Books)

Paper ID : 2289892

Roll No.

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B.TECH.

Regular Theory Examination (Odd Sem-VII), 2016-17
PROCESS EQUIPMENT DESIGN

Time : 3 Hours

Max. Marks : 100

SECTION - A

1. **Attempt all parts. All parts carry equal marks. Write answer of each part in short. (2×10=20)**
- What do you mean by Tensile strength of materials?
 - Explain the term 'Monel' and Inconel'.
 - What is 'Contamination'?
 - What do you understand by 'Creep resistance'?
 - What do you understand by 'Hortonsphere'?
 - What are 'cylindrical shell' and 'spherical shell'?
 - Explain the term 'Carbon Steel'.
 - Define Copper and also write name of its alloys.
 - Explain the term 'Design Stress'.
 - What do you mean by 'nozzle reinforcement'?

Section - B

2. **Attempt any five questions from this section. (10×5=50)**

- A pressure vessel is to be design for the maximum a parting pressure of 500KN/m^2 . The vessel have

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nominal diameter of 1.2m and tangent length of 2.4 m. The vessel is made of IS-2002-1962 grade 2B quality steel having allowable design stress value of 118 MN/m² at working temperature. The corrosion allowable is suggested tube 2mm for the live spend specked for the vessel. The vessel is to fabricate according to class two of IS specification which stipulate the welded efficiency of 0.85.

- i) What will be the standard plate thickness to fabricate this vessel?
 - ii) If a spherical vessel having the same diameter and thickness in fabricated with the quality steel. What maximum pressure will stand safety.
- b) Explain the various types of vessel support and discuss the 'skirt supports' and 'bracket support' with neat sketch and its relevant equation also.
 - c) What do you by 'compensation' for opening? Explain its various types with neat sketch and also discuss the 'equal area method' for calculation of reinforcement required.
 - d) What do you mean by Heads and closures? And also discuss various types of Heads.
 - e) A fractionating tower is 4m in outside diameter by 6m in length from tangent line to tangent line of closures. the tower contains removable trays on 1m tray spacing and is to operate under vacuum at 400°C. The material of construction is IS: 2002-1962(Plain carbon steel). Determine the required

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thickness of shell without. Stiffness and with stiffness located at the tray positions.

- f) Design a self supporting conical roof for a cylindrical storage vessel. The following data are:-

Roof	- Conical
permissible slope	-lin 5
Super imposed load	1250N/m ²
Material	-carbon steel
Permissible stress	-142 N/m ²
Modulus of elasticity	-2×10 ⁵ N/mm ²
Diameter	-20m

Standard plate thickness of 6 mm is available.
J = 70%
- g) In the manufacture of ethyl acetate, etherification of ethyl alcohol is carried out with acetic acid in the presence of sulphuric acid as a catalyst. For a plant producing 1500 tonnes per annum of ethyl acetate and operating 8000 hrs. Per annum, requires 150 kg per hr of acetic acid. It is decided to store 20 days requirement of acetic acid. Design a suitable storage tank for this capacity, using 316 stainless steel. The tank will be filled to 85% of its capacity. The plate of 1000mm×1300 mm size in different thickness can be used, the permissible stress for stainless steel is 1300 kg/cm², density of acetic acid 1055 kg/m³, welded joint efficiency is 85%.