

PART – B: (Short Answer Questions)**(2 x 5 = 10 Marks)**Q.2. Answer ALL questions

	[CO#]	[PO#]
a. What are the factors to be considered for Plant Layout?	1	1
b. Explain the role of Environmental impact, and effluent disposal on site selection Process?	2	2
c. What is AIChE method?	3	2
d. What is a heat exchanger? Mention some of its applications?	3	2
e. What is the purpose of pressure vessel codes and standards	4	2

PART – C: (Long Answer Questions)**(6 x 5 = 30 Marks)**Answer ANY FIVE questions

	Marks	[CO#]	[PO#]
3. Discuss flow sheets of Metal extraction industries.	(6)	1	2
4. Discuss the importance of heat and mass transfer operations.	(6)	1	2
5. A liquid mixture of benzene toluene is being distilled in a fractionating column at 101.3 k Pa pressure. The feed of 100 kmole/h is liquid and it contains 45 mole% benzene (A) and 55 mole% toluene (B) and enters at 327.6 K. A distillate containing 95 mole% benzene and 5 mole% toluene and a bottoms containing 10 mole% benzene and 90 mole% toluene are to be obtained. The amount of liquid is fed back to the column at the top is 4 times the distillate product. The average heat capacity of the feed is 159 KJ/kg mole. K and the average latent heat 32099 kJ/kg moles. Calculate i. The kg moles per hour distillate, kg mole per hour bottoms ii. No. of theoretical stages at the operating reflux. iii. The minimum no. of theoretical stages required at total reflux iv. If the actual no. of stage is 10, what is the overall efficiency increased at operating condition compared to the condition of total reflux? The equilibrium data:	(6)	2	2

Temp. (K)	353.3	358.2	363.2	366.7	373.2	378.2	383.8
X _A	1	0.78	0.58	0.45	0.258	0.13	0
Y _A	1	0.9	0.777	0.657	0.456	0.261	0

6. A liquid feed consisting of 1200 gmole of mixture containing 30% naphthalene and 70% dipropylene glycol is differentially distilled at 100 mm Hg pressure and final distillate contains 55% of the feed solution. The VLE data are	(6)	2	2
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x	8.4	11.6	28.0	50.6	68.7	80.6	88
y	22.3	41.1	62.9	74.8	80.2	84.4	88

a. determine the amount of distillate			
b. determine the naphthalene and in residue and distillate.			
7. A heat exchanger is to be designed to condense an organic vapour at a rate of 500kg/min. Which is available at its saturation temperature of 355 K. Cooling water at 286 K is available at a flow rate of 60 kg/s. The overall heat transfer coefficient is 475 W/m ² C Latent heat of condensation of the organic vapour is 600 kJ/kg. Calculate	(6)	3	2
a) The number of tubes required, if tubes of 25 mm outer diameter, 2mm thick and 4.87m long are available, and			
b) The number of tube passes, if cooling water velocity (tube side) should not exceed 2m/s			
8. A counter flow double pipe heat exchanger using super-heated steam is used to heat	(6)	3	2

water at the rate of 10500 kg/hr. The steam enters the heat exchanger at 180°C and leaves at 130°C. The inlet and exit temperature of water are 30°C and 80°C respectively. If the overall heat transfer coefficient from steam to water is 814 W/m² K, calculate the heat transfer area. What would be the increase in area if the fluid flow were parallel?

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| 9. Design of storage tank and its significance and its safety measures. | (6) | 4 | 2 |
| 10. Design of high pressure vessel and its significance | (6) | 4 | 2 |

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