Reg No.:_____ Name:_____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third Semester B.Tech Degree (S,FE) Examination December 2020 (2015 Scheme)

Course Code: FT205

Course Name: FUDAMENTALS OF HEAT AND MASS TRANSFER

Max. Marks: 100 Duration: 3 Hours

PART A

Answer any three full questions, each carries 10 marks. Marks

1 a) Derive an expression for heat flow through Spherical system by conduction. (7)

b) Define Heat flow rate and give its unit. (3)

2 a) Derive the critical thickness of insulation for plane wall and cylinder. (7)

b) State Fourier law of heat conduction. (3)

3 a) Explain the regimes of heat transfer. (6)

b) What are the differences between drop wise and film wise condensation? (4)

4 a) Derive the dimensional analysis for forced convection. (6)

b) Explain about the boundary layer formation. (4)

PART B

Answer any three full questions, each carries 10 marks.

5 a) Derive the LMTD expression for counter flow heat exchanger by indicating its assumptions involved. (6)

b) What are the basic laws of radiation? (4)

6 a) Explain the working and constructional details of double pipe heat exchanger with a neat sketch. (5)

b) A heat exchanger has 17.5 m^2 area available for heat transfer. It is used for cooling oil at 200^0C by water available at 20^0C. The mass flow and specific heat of oil are 1000Kg/hr and 1.9 kJ/kg K and mass flow and specific heat of water are 3000Kg/hr and 4.187 kJ/kg K. If the overall heat transfer coefficient is 300 W/m^2K, Estimate outlet temperatures of oil and water for parallel flow heat exchanger by NTU Method. (5)

7 a) Discuss the mass transfer theories and how mass is transferred. (5)

b) Derive the equation for equimolar state diffusion of A in liquids. (5)

8	a)	Derive the expression for Ficks law of diffusion with respect to stationary co-ordinate axis.	(7)
	b)	Mention the significance of dimensionless numbers in mass transfer.	(3)

PART C

Answer any four full questions, each carries 10 marks.

9	a)	Explain the types of packing.	(6)
	b)	Explain the concepts of HTU and NTU.	(4)
10	a)	What are the factors to be considered in the selection of absorbents?	(5)
	b)	List out the merits and demerits of plate and packed towers.	(5)
11	a)	Explain the design of packed tower with a neat sketch.	(8)
	b)	Define absorption factor.	(2)
12	a)	What is distillation? Explain the types of distillation process.	(7)
	b)	What is the significance of relative volatility?	(3)
13	a)	Explain the McCabe-Thiele method used for obtaining theoretical plates required for given degree of separation.	(7)
	b)	What is the role of Raoult's law in distillation?	(3)
14	a)	Derive Rayleigh equation.	(5)
	b)	Explain Vapour-Liquid equilibrium in distillation.	(5)

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