

Reg No.: _____

Name: _____

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Third semester B.Tech examinations (S) September 2020

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 the heat conduction equation in cylindrical coordinates. (7)
- b) A temperature difference of 500°C is applied across a fire-clay brick having a 10cm thick and a thermal conductivity of 1.0 W/mK. Find the heat transfer rate per unit area. (3)
- 2 a) Derive the General conduction equation in Cartesian Co-ordinates with all assumptions. (5)
- b) What is meant by critical radius of insulation? (5)
- 3 a) Using Buckingham π Theorem, show that Nusselt number is a function of Reynold's number and Prandtl number. (5)
- b) What is forced convection and free convection? Give example for each. (5)
- 4 a) Explain the classification of boiling process. (6)
- b) What are the differences between drop wise and film wise condensation? (4)

PART B*Answer any three full questions, each carries 10 marks.*

- 5 a) Derive the LMTD expression for parallel flow heat exchanger by indicating its assumptions involved. (6)
- b) Explain the various laws of radiation. (4)
- 6 a) A counter flow heat exchanger with a heat transfer area of 17.5 m² is to be used to cool oil (C_p of oil is 1.9kJ/kg.K) at 473 K. The oil flow rate is 2.77kg/s. Water at 293 K is available as a cooling medium. It flows at a rate of 0.83 kg/s. Calculate the exit temperatures of oil and water if the overall heat transfer coefficient is 300W/m²K. (5)
- b) What is LMTD and NTU? Discuss the advantage of NTU over the LMTD method? (5)

- 7 a) Derive the Molar Flux equation of equimolar counter diffusion of components A & B. (7)
b) Mention the significance of dimensionless numbers in mass transfer. (3)
- 8 a) Explain in detail about the mass transfer theories in fluid flow. (5)
b) What are the analogies in heat, mass and momentum transfer? (5)

PART C

Answer any four full questions, each carries 10 marks.

- 9 Draw a neat sketch of packed absorption tower with explanation. (10)
- 10 Describe criteria for selecting choice of solvent for absorption. (10)
- 11 a) Write down the properties of a good packing for an absorption tower. (6)
b) Give few industrial applications of absorption. (4)
- 12 a) Explain in brief McCabe-Thiele method used for obtaining theoretical plates required for given degree of separation. (8)
b) What is HETP? (2)
- 13 a) Explain boiling curve and dew point curve diagrams for binary mixtures. (10)
- 14 a) What are the common methods used in distillation process? (5)
b) Derive Rayleigh equation. (5)
