

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY**  
**THIRD SEMESTER B.TECH DEGREE EXAMINATION(R&S), DECEMBER 2019**

**Course Code: FT205**

**Course Name: FUDAMENTALS OF HEAT AND MASS TRANSFER**

Max. Marks: 100

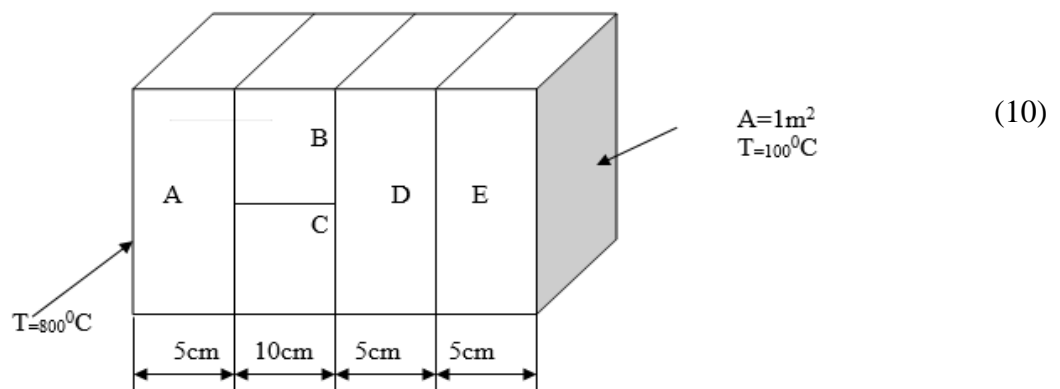
Duration: 3 Hours

**PART A**

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

Marks

- 1 a) What are the different modes of heat transfer? (5)
- b) What is Lumped heat capacity? Give assumptions and equation involved in the lumped capacity analysis. (5)
- 2 a) Determine the heat transfer through the composite wall shown in figure. Take the conductivities of A, B, C, D and E as 50,10,6.7,20 and 30 W/mK respectively and assume one -dimensional heat transfer.



- 3 a) Discuss the different regimes of pool boiling with correlations to represent each regime. (5)
- b) What is dimensional analysis? List out the significance of any two dimensionless numbers. (5)
- 4 a) What is the importance of boilers and condensers in food allied industries? (5)
- b) Differentiate Dropwise and film wise condensation. (5)

**PART B**

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

- 5 a) Emissivities of two large parallel planes maintained at 800°C and 300°C are 0.3 and 0.5 respectively. Find the net radiant heat exchange per square metre for these plates. (5)
- b) Draw the temperature profile curve for counter flow heat exchanger. (5)

- 6 a) In a counter flow double pipe heat exchanger, water is heated from  $250^{\circ}\text{C}$  to  $650^{\circ}\text{C}$  by an oil with specific heat of  $1.45 \text{ KJ/KgK}$  and Mass flow rate is  $0.9 \text{ Kg/s}$ . The oil is cooled from  $230^{\circ}\text{C}$  to  $160^{\circ}\text{C}$ . If the overall heat transfer coefficient is  $420 \text{ W/m}^2\text{K}$ , Calculate the following, (i) rate of heat transfer (ii) mass flow rate of water (iii) surface area of the heat exchanger. (10)
- 7 a) Explain mass transfer theories in turbulent flow. (10)
- 8 a) State Fick's law relative to an observer moving with molar average velocity. Discuss its analogy with heat and momentum flux. (5)
- b) Derive the Molar Flux equation of component A of a mixture A and B, where A is diffusing and B is Non-Diffusing. (5)

### PART C

*Answer any four full questions, each carries 10 marks.*

- 9 a) Describe criteria for selecting choice of solvent for absorption. (10)
- 10 a) With neat sketch explain the construction and working of any industrial absorber. (10)
- 11 a) Elaborate the stages in the determination of number of stages in the design of a tray tower for absorption. (10)
- 12 a) Differentiate i) Simple distillation  
ii) Steam Distillation (10)  
iii) Flash Distillation
- 13 a) With a neat figure write down the Material and Energy balance equations in a continuous distillation column. (10)
- 14 a) Explain Vapour-Liquid equilibrium for binary mixtures. (10)

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