D 70315 **(Pages : 2)** **Name**.....

Reg. No.....

FIFTH SEMESTER B.TECH. (ENGINEERING) [09 SCHEME] DEGREE EXAMINATION, NOVEMBER 2014

ME/PTME/AM 09 501—HEAT AND MASS TRANSFER

Time : Three Hours Maximum : 70 Marks

Part A

Answer **all** *questions.*
Each question carries 2 *marks.*

1. What is critical radius of insulation ?
2. What is lumped heat capacity analysis ?
3. What is meant by boiling curve ?
4. Find the temperature of the Sun assuming as a black body, if the intensity of radiation is maximum at the wavelength of 0.5.
5. Give the expression for NTU.

(5 × 2 = 10 marks)

Part B

Answer any **four** *questions.*
Each question carries 5 *marks.*

6. Define thermal conductivity. How does it vary with temperature for gases ?
7. Derive an expression for steady-state on dimensional heat conduction through a hollow cylinder.
8. Explain about the concept of boundary layer.
9. Brief about various promoters used for maintaining drop wise condensation.
10. Explain radiation spectrum.
11. State and explain Fick's law of diffusion and give its expression.

(4 × 5 = 20 marks)

Part C

Answer **all** *questions.*
Each question carries 10 *marks.*

12. (a) Derive the general 3D heat conduction equation in cylindrical co-ordinates. Assume the material as homogeneous isotrophic continues.

Or

Turn over

(b) Derive an expression for the heat conduction through a hollow cylinder from the general heat conduction equation. Assume steady-state unidirectional heat flow in radial dimension and no internal heat generation.

13. (a) A very large plate 5 m. height is maintained at 100° C. and exposed to air at 30° C. Calculate the convection heat transfer coefficient.

Or

(b) Air at 8 kN/m^2 and 242° C. flows over a flat plate of 0.3 m. wide and 1 m. long at a velocity of 8 m/s. If the plate is maintained at a temperature of 78° C., estimate the heat to be removed continuously from the plate.

14. (a) The intensity of radiation emitted by the Sun is maximum at the wave length of 0.5 μ. As a black body, determine its surface temperature and the emissive power.

Or

(b) Explain in brief about :

(i) concept of black body and grey body.

(ii) thermal radiation.

15. (a) Compare diffusion and convective mass transfer.

Or

(b) Dry air at 27° C. and 1 bar flows over a wet plate 0.5 m. long at a velocity of 50 m/s. Calculate the mass transfer coefficient of water vapour in the air at the end of the plate.

(4 × 10 = 40 marks)