Roll No. | | | | | | | | | | | | Total No. of Pages : 02

Total No. of Questions : 18

B.Tech. (ME) (2012 Onwards) (Sem.–6)

# HEAT TRANSFER

Subject Code : BTME-602

M.Code : 71186

Time : 3 Hrs. Max. Marks : 60

**INSTRUCTIONS TO CANDIDATES :**

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

## SECTION-A

**Write briefly :**

1. Define Thermal conductivity.
2. What are the different assumptions applied while doing heat conduction analysis?
3. In case of insulating an electric wire, should the outer radius of insulation be more or less than the critical radius, briefly explain with reason.
4. Why thin fins are preferred over a thick fin?
5. Define the term NTU. What does it interpret?
6. Define the term intensity of radiation.
7. Define Grashoff Number. What are the forces associated with it?
8. In which type of condensation heat transfer coefficient remains more and why?
9. What is Newtonian heating of solids?
10. What is the limitation of Rayleigh's method of dimensional analysis?

## SECTION-B

11. What are the three dimensions in case of spherical coordinate system? How they are obtained?

12. Derive the relation of temperature distribution and heat transfer for rectangular fin losing heat at the tip.

13. Prove by dimensional analysis for natural convection that Nusselt no. is a function of Grashoff no. and Prandtle no.

14. Explain different theories of nucleation.

15. State and explain Kirchoff's law.

## SECTION-C

16. An electric wire with 2mm diameter is covered with 2.5mm thick layer of insulation with k = 0.5 W/mK. Heat is dissipated to the atmosphere at 25°C with h=10W/$m^2$K. The wire is maintained at temperature of 120°C. Estimate the heat dissipation from the wire with and without insulation. Calculate the thickness of insulation when the heat dissipation rate is maximum, also maximum value of heat dissipation rate.

17. The A parallel flow, heat exchanger has hot and cold water streams running through it and has the following data : $m_h$ = 10kg/min, $m_c$ = 25kg/min, $C_{ph}$ = $C_{pc}$= 4.18 kJ/kg°C, $t_{h1}$ = 70°C, $t_{h2}$ = 50°C, $t_{c1}$ = 25°C. Heat transfer coefficients on both sides are 50 W/$m^2$. Calculate:

    a) The area of heat exchanger

    b) The exit temperatures of hot and cold fluids if hot water flow rate is doubled.

18. Write short notes on :

    a) Hydrodynamic and thermal boundary layer

    b) Variable thermal conductivity

**NOTE : Disclosure of identity by writing mobile number or making passing request on any page of Answer sheet will lead to UMC against the Student.**