

Roll No. : .....

Total No. of Questions : 9 ]

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**3314**

**B.Tech. (ME) 6th Semester (Supplementary)**

**Examination, July-2021**

**(G Scheme)**

**HEAT TRANSFER**

**Paper-PCC-ME-306-G**

*Time : Three Hours ]*

*[ Maximum Marks : 75*

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*Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.*

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*Note :- Attempt five questions in all, selecting one question*

*from each Unit. Question No. 1 is compulsory.*

*All questions carry equal marks.*

1. (i) Define the term fin effectiveness.
- (ii) What is the difference between natural and forced convection ?

- (iii) State Stefan-Boltzmann law.
- (iv) Define transient state of heat transfer.
- (v) Differentiate between laminar and turbulent flow.
- (vi) Define thermodynamic boundary layer thickness.  $2\frac{1}{2} \times 6 = 15$

Unit-I  
15 each

- 2. Derive 3D general heat conduction equation in cylindrical co-ordinates.
- 3. Explain different modes of heat transfer with suitable examples. Also state and explain law of conservation of energy.

Unit-II  
15 each

- 4. Explain transient heat conduction in a sphere with convective boundary conditions.
- 5. A solid copper sphere of 10 cm diameter [ $\rho = 8954 \text{ kg/m}^3$ ,  $C_p = 383 \text{ J/kg K}$ ,  $k = 386 \text{ W/mK}$ ], initially at uniform temperature  $t_i = 250^\circ\text{C}$ , is suddenly immersed in a fluid which is maintained at a uniform temperature  $t_a = 50^\circ\text{C}$ . The heat transfer coefficient between the sphere and the fluid is  $h = 200 \text{ W/m}^2$ . Determine the temperature of the copper block at  $\tau = 5 \text{ min}$  after the immersion.

Unit-III  
15 each

- 6. Derive the expression for the free convection over a vertical flat plate.
- 7. Derive the expression for heat exchange between non-black bodies.

Unit-IV

- 8. Explain parallel and counterheat exchanger and calculate its effectiveness.
- 9. Explain the following :
  - (a) Nucleate and film boiling
  - (b) Boiling regimes

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