

Roll No. :

Total No. of Questions : 9] [Total No. of Pages : 3

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**B.Tech. (ME) 6th Semester (Supplementary)
Examination, July-2021
(G Scheme)**

**HEAT TRANSFER
Paper-PCC-ME-306-G**

Time : Three Hours] [Maximum Marks : 75

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.

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 ?

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- (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. 2½×6=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.

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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. 15
9. Explain the following :
 - (a) Nucleate and film boiling
 - (b) Boiling regimes 8,7

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