No. of Printed Pages : 3

BIME-026

DIPLOMA IN MECHANICAL ENGINEERING - (DMEVI)

01935

Term-End Examination

June, 2012

BIME-026: HEAT TRANSFER

Time : 2 hours *Maximum Marks : 70*

*Note : Attempt **any five** question. All questions carry **equal** marks. Use of scientific calculator is permitted.*

1. (a) What is meant by thermal resistance ? Explain the electrical analogy for solving heat transfer problems. 7+7

   (b) Differentiate between thermal conductivity and thermal diffusivity.

2. (a) Discuss critical thickness of insulation and its importance in engineering practice. 7+7

   (b) Distinguish between natural and forced convection heat transfer.

3. (a) Define Reynolds number, Nusselt number, and Stanton number. Explain their importance in convective heat transfer. 7+7

   (b) Explain the concept of black body and grey body in radiation terminology.

4. (a) Define absorptivity, reflectivity and transmissivity. 7+7

(b) A furnace wall is made up of three layers, one of brick, one of insulating brick and one of red brick. The inner and outer surfaces are at 870° C and 40° C respectively. The thermal consuctivities of the layers are 1.17 W/mk, 0.139 W/mk, and 0.875 W/mk respectively and thickness are 22cm, 7.5cm, and 11cm. Assume close bonding of the layers at their interfaces, find out the rate of heat-loss per square meter per hour and interface temperature.

5. (a) Define fin effectiveness. When is the use of fins not justified ? 7+7

(b) Define Laminar and turbulent flows. Discuss Laminar sublayer, and turbulent layer in a boundary layer.

6. (a) Describe Newton's law of cooling. Also explain convective heat transfer coefficient. 7+7

(b) Distinguish the pool boiling from forced convection boiling.

7. (a) State Planck's distribution law and list down its features. 7+7

(b) A black body has a total emissive power of 1000 W/m^2, Calculate.

(i) its surface temperature

(ii) The wavelength at which the body has maximum spectral emissive power.

Given $\sigma = 5.67 \times 10^{-8}\ W/m^2\ k^4$

The wavelength corresponding to maximum emissive power λ_{max} $T = 2897.6\ \mu m\ K$.