BIME-026

DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

Term-End Examination

December, 2016

00212

BIME-026 : HEAT TRANSFER

Time : 2 hours *Maximum Marks : 70*

Note : *Attempt any **five** questions. All questions carry equal marks. The use of scientific calculator is allowed.*

1. (a) What are the different modes of heat transfer ? How do these modes of heat transfer differ ?

   (b) Differentiate between dropwise and filmwise condensation. 7+7

2. (a) Find the expression for heat conducted (q) through a slab of thickness (L), cross-sectional area (A) having temperatures T_1 and T_2 at both ends for steady state.

   (b) How do thermal conductivities of gases and liquids vary with temperature ? 7+7

3. (a) Describe Stefan-Bultzmann's law.

(b) A black body of surface area 2×10^{-3} m^2 is heated to 127°C and is suspended in a room having temperature 27°C. Find the initial rate of loss of heat from the black body. 7+7

4. (a) Explain electrical analogy for heat transfer. Find the thermal resistance for conduction and convection heat transfer.

(b) An electric heater emits 1000 watts of thermal radiation. The filament has surface area 0·06 m^2 and may be presumed as a black body. Find its temperature, if $\sigma = 6 \times 10^{-8}$ $W/m^2 K^4$. 7+7

5. (a) Describe briefly the thermal boundary layer over a flat plate with flow of fluid.

(b) A hollow cylinder has inside radius 2·5 cm and outside radius 5 cm. Inside temperature is 300°C and outside temperature is 110°C. Find the temperature at 3·75 cm from the centre, if K = 70 W/m-K. Also find the heat flow through the cylinder, per unit length. 7+7

6. (a) What do you understand by 'black body' ? Is ice a black body ? Justify your answer.

(b) Explain the various regimes of the saturated pool boiling. 7+7

7. (a) What is Kirchhoff's law of radiation ? Explain.

(b) Prove that the shape factor of the cylindrical cavity as shown in Figure 1 is $\frac{4h}{4h + d}$. 7+7

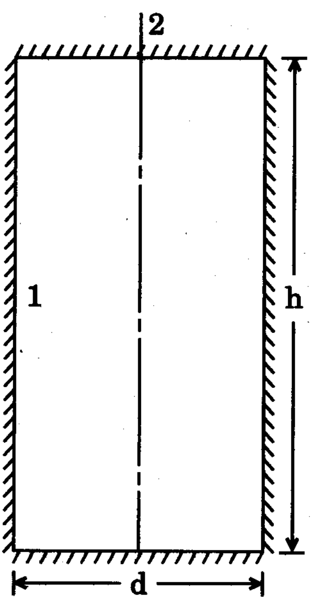

Figure 1