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# DIPLOMA – VIEP – MECHANICAL ENGINEERING (DMEVI)

## Term-End Examination

00154 **June, 2017**

## BIME-026 : HEAT TRANSFER

*Time : 2 hours* *Maximum Marks : 70*

***Note :*** *Attempt **five** questions in all. Question no. **1** is **compulsory**. All questions carry equal marks. Use of scientific calculator is permitted. Assume missing data, if any, suitably.*

**1.** Choose the correct answer from the given four alternatives : *7×2=14*

(a) Body A is kept in contact with body B. Heat will flow from A to B, if the

(i) heat content of A is greater than that of B

(ii) temperature of A is greater than that of B

(iii) specific heat of A is greater than that of B

(iv) specific heat of A is lower than that of B

(b) Which one of the following will have least value of thermal conductivity ?

(i) Copper
(ii) Silver
(iii) Glass
(iv) Air

(c) Heat is transferred by conduction, convection and radiation in

(i) insulated pipes carrying hot water
(ii) refrigerator freezer coils
(iii) melting of ice
(iv) boiler furnaces

(d) Pipes are insulated so that

(i) they may not break under pressure
(ii) there is minimum corrosion
(iii) they can withstand higher fluid pressure
(iv) heat loss from the surface is minimized

(e) Steady state heat transfer occurs when the flow of heat is

(i) negligible
(ii) uniform
(iii) independent of time
(iv) uniformly decreasing

(f) When an analogy is drawn between heat flow and electricity flow in circuits, the heat flow of thermal circuits is equated in the electrical circuit against

(i) Voltage
(ii) Current
(iii) Resistance
(iv) Charge (Coulombs)

(g) The relation between the emissive and absorptive powers of a surface is developed under

(i) Planck's law

(ii) Kirchhoff's law

(iii) Electrical analogy

(iv) Stefan-Boltzmann law

**2.** (a) What are the different modes of heat transfer ? Explain their potential for occurrence.

(b) A slab 50 cm thick is made of five bricks (k = 1·5 W/m-K). For the same heat transfer and same temperature drop, what will be the wall thickness of the material having thermal conductivity 0·75 W/m-K ? *7+7*

**3.** Determine the heat flow across a plane wall of 10 cm thickness with a thermal conductivity of 8·5 W/m-K. When the surface temperatures are steady at 200°C and 50°C, the wall area is 2 $m^2$ ? Also find the temperature gradient in the flow direction. *14*

**4.** Prove that the thermal resistance offered by a hollow long cylinder of constant thermal conductivity is given by

$$R_{cyl} = \frac{ln\left(\frac{r_2}{r_1}\right)}{2\pi LK},$$

where

$r_1$ = inner radius

$r_2$ = outer radius

L = length of cylinder

K = thermal conductivity of material. *14*

5. (a) Explain the criteria of selection of fins.

(b) How is thermal performance of a fin measured ? Give a few specific examples of use of fins. 7+7

6. Write short notes on any ***four*** of the following : $4 \times 3\frac{1}{2} = 14$

(a) Wien's Displacement Law

(b) Laminar Flow

(c) Absorptivity

(d) Prandtl's Number

(e) Thermal Diffusivity

(f) Biot's Number