

**DIPLOMA VIEP MECHANICAL ENGINEERING  
(DMEVI)**

**Term-End Examination**

**June, 2014**

**BIME-026: HEAT TRANSFER**

*Time : 2 hours*

*Maximum Marks : 70*

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

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1. (a) What are the modes of heat transfer ? 7+7  
Discuss the difference between them.  
(b) Define thermal conductivity and explain its significance in heat transfer.
  
2. (a) Define Fourier's Law. Why there is a negative sign in the Fourier's law of heat conduction ? 7+7  
(b) A plane wall of fireclay brick, 25 cm thick is having temperature 1350°C and 50°C on two sides. The thermal conductivity of fireclay varies as :  
 $k = 0.838(1 + 0.0007 T)$ , where T is in degree celcius.  
Calculate the heat loss per square metre through the wall.
  
3. (a) How is boundary-layer thickness defined ? 7+7  
(b) Define and explain Prandtl number, Reynold's number, Rayleigh number.

4. (a) Why extended surface are most commonly used ? Define fin effectiveness. 7+7
- (b) A very long 25 mm diameter copper ( $k = 380 \text{ W/mK}$ ) rod extends from a surface at  $120^\circ\text{C}$ . The temperature of surrounding air is  $25^\circ\text{C}$  and the heat transfer coefficient over the rod is  $10 \text{ W/m}^2\text{K}$ .  
Calculate :  
(i) Heat loss from the rod.  
(ii) How long the rod should be in order to be considered infinite.
5. (a) State Planck's distribution law and list down its features. 7+7
- (b) Two parallel infinite gray surfaces are maintained at temperature of  $127^\circ\text{C}$  and  $227^\circ\text{C}$  respectively. If the temperature of the hot surface is increased to  $327^\circ\text{C}$ . By what factor is the net radiation exchange per unit area increased. Assume the emissivities of colder and hotter surfaces to be 0.9 and 0.7 respectively.
6. (a) Explain pool boiling phenomenon. 7+7
- (b) Explain the mechanism of laminar film condensation on vertical plate.
7. Write short notes on **any four** of the following : 14
- (a) Black body  
(b) Kirchhoff's law  
(c) Opaque body  
(d) Total emissive power  
(e) Radiosity
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