B.Arch. Part-IV 8th Semester Final Examination, 2007

Subject:{Elective-II} Energy & Buildings   Code: (ME-801/A)
Full Marks: 50   Time: 2 Hours

A. Figures in the margin indicate full marks for the question.
B. Use only one answer script
C. Two marks reserved for overall neatness.

Answer Question No. 6 and *any Three* from the rest.

1.
    a. What are the major components and general considerations for passive solar design?
    b. Describe with annotated sketches three major types of passive solar systems and their salient features.

                                                                                                              3+9 = 12

2.
    a. Illustrate Time lag and Decrement factor with the help of graphical presentation.
    b. Explain Thermal Diffusivity showing the relationship among different factors
    c. Describe how the general equation of the periodic heat flow is derived.

                                                                                                              2+4+6 = 12

3. Write Short notes on *any four* of the following:
    i. Different forms of energy – Primary, Secondary etc.
    ii. Thermal balance equation (steady state)
    iii. Solar gain factor
    iv. Thermosiphon
    v. Roof Pond
    vi. Phase change material (PCM)

                                                                                                              3x4 = 12

4.
    a. What is 'Thermal Bridging'?
    b. Explain with annotated sketch 'Temperature Gradient' across a building envelope. How is it related to the thermal resistance of various layers of the envelope?
    c. Mention the merits and demerits of different mechanical heating systems in a tabular form.

                                                                                                              3+4+5 = 12

5.
    a. What are the different levels of cooling for a building?
    b. Passive Cooling is much more dependent on climate than passive heating – Justify with examples of various passive cooling strategies.
    c. Discuss *any one* of Radiant Cooling and Earth Cooling with its working principles and applicability.

                                                                                                              2+4+6 = 12

6.
    a. A certain uninsulated cavity wall has a U-value of 0.91 W/m^2 degC. If expanded polyurethane board is included in the construction what minimum thickness of the board is needed to reduce the U-value to the half of its initial value? Thermal Conductivity of the expanded polyurethane is 0.025 W/m.degC.
    b. A room has an external wall with a U-value of 1.5 W/m^2 degC and its air temperature is maintained at 26°C when the outside temperature is 38°C. Calculate the boundary temperature on the internal surface of the wall. The internal surface resistance is 0.123 m^2 degC/W.
    c. The cooling load on an air-conditioning system is 5.0 kW for maintaining indoor temperature at 26°C. If the supply air temperature is 16°C and the air inlet velocity is to limited to 2 m/sec, calculate the size (area and dimension) of the inlet opening.   4+4+4 = 12