B.Arch. 7th Semester Final Examination, 2012

Subject: Energy Efficient Architecture **Code: (AR 704)**
Full Marks: 35 **Time: 2 Hours**

A. Figures in the margin indicate full marks for the question.
B. Use only one answer script

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

1.
   a. Explain briefly the sequences of stages of cooling for a building.
   b. Discuss *any one* of Evaporative Cooling and Earth Cooling with its working principles and applicability.

   $$3+5 = 8$$

2.
   a. Illustrate Time lag and Decrement factor with the help of graphical presentation.
   b. What are the major limitations in the assumptions of heat transfer under steady state conditions?
   c. What is meant by "Tonnage of Refrigeration"?

   $$4+2+2 = 8$$

3. Write Short notes on *any two* of the following:
   i. Occurrence of Thermal Bridge in building construction.
   ii. Building Automation System as a part of Integrated Building Management System.
   iii. Various aspects of Energy Audit of buildings.
   iv. Fixing of standard solar photovoltaic (SPV) modules on building roof or open ground.

   $$2x4 = 8$$

4.
   a. Explain with annotated sketch 'Temperature Gradient' across a building envelope. How is it related to the thermal resistance of various layers of the envelope?
   b. Write the salient points on design and installation (orientation, tilt etc.) of active solar collectors.

   $$4+4 = 8$$

5.
   a. What is meant by "Green Building"?
   b. Name the Primary Rating systems followed in India for Green Buildings.
   c. Describe *any one* of the Rating systems.

   $$2+2+4 = 8$$

6.
   a. A 4x4m and 3m high room is located on an intermediate floor of a large building. The room has only one exposed wall facing south. The exposed wall (4x3m) consists of a single glazed window of size 3x1.5m (U= 4.5 W/ m^2 degC), and the rest is made of 250mm plastered brick (U= 1.4 W/ m^2 degC).
   4 nos. 40W fluorescent lamps are in continuous use and the ventilation rate is 5 air changes per hour (ACH). The highest outdoor temperature for 90% of the time (Design outdoor temperature) is 34°C (To). Solar radiation intensity is taken as 800 W/m^2 (I).
   Absorbance of the wall surface: a = 0.5
   Surface conductance (outside): f_o = 10 W/ m^2 degC
   Solar gain factor for window: θ = 0.75

   Considering no evaporation loss, calculate the capacity of an air conditioning system in order to maintain the indoor air temperature at 24°C.

   b. If the supply air temperature is 18°C, and the air inlet velocity is limited to 2m/sec, calculate the size of the inlet opening.

   $$8+3 = 11$$