CENTRE FOR ENERGY STUDIES

ESL-840 Solar Architecture

Time: 2hrs | **Major Test** | M.M: 50

Attempt All Questions

1. Describe the working principal of semitransparent PV module Trombe wall with figure for vent condition. Further, write down energy balance equation for the same with mass flow ratio of $\dot{m}_f$ and discuss the limiting cases.

(10)

2. Derive an electrical efficiency of semi-transparent PV module and show that its electrical efficiency is higher than electrical efficiency of opaque PV module for the following parameters:

α_c =0.5, α_T =0.9, ß=0.9, $ß_o$=0.0045/ °C, η_{mo} =0.12,U_t=5.54W/m^{2o}C, U_b=2.723 W/m^{2o}C and I=500 W/m^2, A_m=1m^2.

(10)

3. **(a)** Discuss the working principle of rock bed regenerative cooler with figure. (5)

(b) Calculate the cost/kwh for semitransparent PV Module with cash flow diagram for the following parameters:

P= ₹2500, S= ₹500, Annual energy saving = 100kWh and O&M= ₹300.

(5)

4. Define the following.
   a) Surface azimuth angle with figure.
   b) Energy paybak time for building.
   c) Numbers of air change (N)
   d) Thermal comfort with activity level of human being
   e) Direct and indirect gain with figure.

(10)

5. **(a)** Derive an expression for solair temperature for wetted vertical wall in a steady state condition with working principle and figure. (5)

(b) Calculate zenith angle for New Delhi for April 30, 2015 at 12noon.

(5)