

Centre for Energy Studies

Non-Conventional Energy Sources : ESL-340

Time : 2 hrs.

(Major Test)

MM : 40

Attempt all questions

1. a) Derive an expression for electrical efficiency (η) of PV module with (i) tedlar and (ii) glass –glass with diagram. (5)

b) A cube of 'hot rock' of side 'h' has its top surface at a depth 'd' below the earth's surface. The material above the cube has thermal conductivity 'K'. The rock as an isothermal mass at temperature 'T' above earth's surface with no internal heat source, then so that the time constant is given by

$$\tau = \frac{\rho h C d}{K} \quad (5)$$

The 'ρ' and 'C' are density and specific heat of rock.

2. a) Write down the overall thermal and electrical (exergy) efficiency of photovoltaic thermal air heat (PV/T air heater). (3)

b) Define light and dark reactions with chemical reaction. (2)

C) Draw the diagram of floating and fixed dome biogas plant with working principle, advantages and disadvantages of both plants. (5)

3. a) Derive an expression for power for a fluid jet striking with a moving (u_1) vertical plate with diagram. (5)

b) Prove that the power co-efficient (C_p) of wind energy conversion system (WECS) is given by

$$C_p = 4 a (1-a)^2$$

where

$$a = \frac{u_o - u_1}{u_o} \quad (5)$$

4. a) Derive an expression for sunshine hour (N) and plot the curve between N and north latitude for March 21, 2008. (5)

b) Write down working principle of solar still with diagram and energy balances for water mass, glass cover and basin liner. (5)