Center for Energy Studies
Major Test: ESL-340

M.M.40 Time: 2 hour

Attempt all questions.

1 (a) Derive an expression for Energy content (E_0) and time constant (τ) for Hot Dry Rock (HDR) System with diagram. (5)

(b) Derive an expression for pay back time (n_p) in terms of initial investment (P), cash flow (CF), life of the system (n) and the rate of interest (i) with cash flow diagram . (5)

2 (a) Derive an expression for electrical efficiency (η)of photovoltaic (PV) module as a function of I(t), η_o and other design parameters. (5)

(b) Describe the working principle of floating and fixed dome type biogas plant with diagram. (5)

OR

(c) Write down light and dark reaction for photosynthesis with brief discussion. (5)

3(a) Justify the statement.
Wind turbine operation with constant tip speed ratio provides relatively higher power generation. (1)

(b) Explain the different methods of controlling variable wind turbine speeds for maximum power generation. (2)

(c) Power extracted from drag wind machines is significantly lower than that of lift based machines. (2)

4(a) Write down energy balance equation for built-in-storage water heater with diagram. Plot the efficiency and temperature curve with depth of water. (5)

(b) Derive an expression for solair temperature for bare surface with basic energy balance. (5)

(c) Define zenith angle, surface azimuth angle and declination angle with diagram. (5)