1T01437 - B.E.(Mechanical) Engineering)(SEM-VII)(Choice Base Credit Grading System) ((R - 19-20) (C Scheme) / 42874 - Renewable Energy Systems (DLOC - III) QP Code: 10027801
Date : 20/06/2023

Duration: 3hrs   **[Max Marks:80]**

N.B. : (1) **Question No 1 is Compulsory.**
          (2) **Attempt any three questions out of the remaining five.**
          (3) **All questions carry equal marks.**
          (4) **Assume suitable data, if required and state it clearly.**

1	Solve any four	20
a	Describe the current scenario of non-conventional energy sources of the World.	
b	Describe the types of solar photovoltaic systems.	
c	Describe the working principle of vapour dominated geothermal power plant.	
d	Describe the working principle of solar paraboloid concentrating collector.	
e	State the factors considered for site selection to install wind power plant.	
2 a	Illustrate the working principle of fixed dome biogas plant with the neat sketch.	10
b	Estimate the monthly average of daily global radiation on a horizontal surface at Baroda, 22° N, 73 ° 10' E on 15th September. If the average sunshine hour/day is 11, a = 0.31, b = 0.47. (Assume Isc =1367 W/m^2)	10
3 a	A solar photovoltaic plant system installation is expected to minimize the plant's annual energy bill by Rs. 15 lacs. If the capital cost of new solar photovoltaic plant installation is Rs. 85 lacs and the annual operating and maintenance cost is 4 lacs. Determine,	8

(a)The expected payback period for the project

(b)The initial rate of return / return on investment.

b	Describe the different methods of hydrogen production and storage.	6
c	Describe the working principle of oscillating water column wave energy conversion technique.	6
4 a	A propeller type horizontal wind turbine having wind characteristics, speed of wind is 18 m/s at 1 standard atmospheric pressure and 17 ºC. The rotor has diameter of 100 m and its operating speed is 42 rpm at maximum efficiency. Determine: a) the total power density in the wind b) the maximum obtainable power density assuming η=42 % c) the torque and axial thrust	8
b	Illustrate the working principle of single and double basin tidal system with the neat sketch.	8
c	Discuss the I-V characteristics of a solar PV cell.	4

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5   a   Discuss the factor which affects the efficiency and life cycle of solar PV cell.   8

    b   Describe the working of a natural circulation solar water heater with a help of   8
neat sketch.

    c   Calculate the solar declination angle and day length at a location, latitude 35 °N   4
on March 20.

6   a   Describe the working principle of solar cooker and drier system with a neat   8
sketch.

    b   Following data is given for a family biogas digester;   8
C.V. of methane = 26 MJ/m^3, Burner efficiency = 65 %, Number of cows = 6,
Retention period = 28 days, Temperature of fermentation = 30^{0}C, Day matter
collected/cow/day = 2.5 kg, Density of matter in the fluid in the digester = 50
kg/m^3 Biogas yield=0.25 m^3/ kg of dry input, Methane production in Biogas =
0.8.
Determine volume of Digester and power available from biogas digester.

    c   State the dissimilarity between horizontal axis wind turbine and vertical axis   4
wind turbine.

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