

CBCS SCHEME

17EE563

Fifth Semester B.E. Degree Examination, Aug./Sept.2020 Renewable Energy Resources

Time: 3 hrs.

Max. Marks: 100

Note: Answer any FIVE full questions, choosing ONE full question from each module.

Module-1

- 1 a. Discuss causes of energy scarcity. Further mention factors to be consider for solving energy crunch problem. (08 Marks)
- b. With the help of diagram, explain the following :
i) Altitude angle ii) Declination angle iii) Latitude angle iv) Hour angle. (08 Marks)
- c. Calculate the following hour angle when :
i) 3 Hour after solar noon ii) 2 Hour 20min before solar noon. (04 Marks)

OR

- 2 a. Define Energy and Energy Resources. Discuss different way of their classification with examples in each category. (08 Marks)
- b. With neat sketch, explain SUN – Earth geometric relationship. (06 Marks)
- c. With neat sketch, explain layers of SUN. (06 Marks)

Module-2

- 3 a. What are Solar Collectors? Give their classification and compare them based on construction and area of application. (08 Marks)
- b. What are the advantages and disadvantages of photovoltaic solar energy conversion? (06 Marks)
- c. For a typical photovoltaic cell, the following performance parameters are obtained from the I-V characteristics :
Open Circuit Voltage (V_{OC}) = 0.61 l.
Short Circuit Current (I_{SC}) = 2.75.
Voltage corresponding to cell maximum power output (V_{MP}) = 0.5.
Current corresponding to cell maximum power and output (I_{MP}) = 2.59.
Calculate fill factor of the cell. (06 Marks)

OR

- 4 a. Draw and explain electrical equivalent circuit model and Current voltage characteristics of solar cells. (08 Marks)
- b. Explain Application of Solar Cell Systems. (06 Marks)
- c. Find the number of solar cells for the array area of $28.5m^2$ if each cell has a diameter of 2.25 inches. (06 Marks)

Module-3

- 5 a. State and explain methods of Hydrogen Production Technologies. (08 Marks)
- b. Describe the main consideration in selecting a site for wind generators. (06 Marks)
- c. Explain any six advantages and disadvantages of Horizontal – axis wind turbines. (06 Marks)

OR

1 of 2

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, $42+8 = 50$, will be treated as malpractice.

- 6 a. What is the basic principle of Wind energy conversion? Also derive the expression for power developed due to wind energy conversion. (08 Marks)
- b. Briefly discuss environmental effects of geothermal energy. (06 Marks)
- c. With neat sketch, explain flash geothermal power plants. Mention its advantages and disadvantages. (06 Marks)

Module-4

- 7 a. Draw the schematic representation of the following gasifiers, explain their working and application area : i) Down draft gasifier ii) Cross draft gasifier. (08 Marks)
- b. With schematic diagram, explain cooling and cleaning of gasifiers. (06 Marks)
- c. What are the advantages and disadvantages of Tidal power. (06 Marks)

OR

- 8 a. Describe the construction and working of a biogas plant, its material aspects and utilization of plant product. (08 Marks)
- b. Explain two – basin system of tidal power harnessing further discuss their advantages and limitations. (06 Marks)
- c. For a typical tidal power plant shown in fig.Q8(c), the basin area is $25 \times 10^6 \text{ m}^2$. The tide has a range of 10m. However, turbine stops working when the head on it falls below 2m. Assume that density of sea water is 1.025 kg/m^3 , acceleration due to gravity is 9.81 m/s^2 . Combined efficiency of turbine and generator is 75% and period of energy generation is 6h and 12.5 min. Calculate i) Work done in filling of empty basin ii) Average power iii) The energy generated in one filling process. (06 Marks)

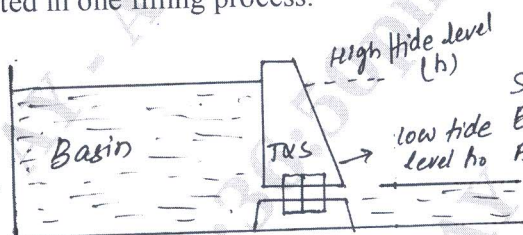


Fig.Q8(c) Single Basin Tidal Plant

Module-5

- 9 a. Derive expression to obtain power associated with sea wave. (06 Marks)
- b. A 2-m sea wave has a 6s period and occurs at the surface of 100-m deep water. Assume sea water density equals to $1,025 \text{ kg/m}^3$. Calculate the energy and power density of the wave. (06 Marks)
- c. Discuss with neat sketch, OTEC system based on : i) Open cycle ii) Closed cycle. (08 Marks)

OR

- 10 a. What is the basic principal of OTEC? (06 Marks)
- b. With neat sketch, explain Basic Rankin Cycle and its working. (06 Marks)
- c. Explain Carnot efficiency for an OTEC plant with the help of thermodynamic cycle on a T-S plane. (08 Marks)

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