

Code No: RT41026

**R13****Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February/March - 2018

**NON CONVENTIONAL SOURCES OF ENERGY**

(Open Elective)

Time: 3 hours

Max. Marks: 70

*Question paper consists of Part-A and Part-B**Answer ALL sub questions from Part-A**Answer any THREE questions from Part-B*

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**PART-A (22 Marks)**

1. a) Define and briefly explain day length and surface azimuth angle. [4]
- b) Describe the collector efficiency curve of the flat-plate collector. [4]
- c) If the saturation current is  $10^{-8} \text{ Am}^{-2}$ , calculate and draw the I-V characteristic as a graph to 0.2 V. [3]
- d) A large wind turbine has a blade diameter of 100 m, at what rotor speed (frequency) will the tip-speed exceed the speed of sound? [4]
- e) Briefly describe how the wave energy is extracted from different devices. [4]
- f) Describe in brief the profile of hot dry rock system for calculating heat content. [3]

**PART-B (3x16 = 48 Marks)**

2. a) Estimate the monthly average daily global radiation using Kleen's recommendation, on a horizontal surface at New Delhi ( $28^{\circ}38' \text{ N}$ ,  $77^{\circ}17' \text{ E}$ ) during the month of April if the average sunshine hours per day are 9.5. Use the relation.

$$\hat{H}_g / \hat{H}_0 = a + b(\hat{S} / S_{\max})$$

$\hat{H}_g$  = Monthly average of the daily global radiation on horizontal surface at a location in  $\text{kJ/m}^2\text{-day}$

$\hat{H}_0$  = Monthly average of the daily global radiation on a horizontal surface at the same location on a clear sky in  $\text{kJ/m}^2\text{-day}$

$\hat{S}$  = Monthly average sunshine hours per day at the location in hour

$S_{\max}$  = Maximum day length a, b, are constants by fitting data, given as 0.25 and 0.45 respectively. [8]

- b) Explain how the solar radiation is determined on tilted surface for Indian conditions. [8]
3. a) Describe the operation of non-convective solar pond for the solar energy collection and storage. [8]
- b) Derive the relation for transmittance coefficient for the series of glass covers in flat plate collector. [8]

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4. a) Draw the I-V characteristics of PV cell and describe the system configuration for maximum power extraction from PV system. [8]  
b) Explain step-by-step procedure of perturb & observe method of maximum power point technique. [8]
5. a) Briefly describe cut-in speed and cut-out speed in wind energy conversion system. [6]  
b) Explain maximum power point tracking procedure in a wind energy conversion system. [10]
6. a) Explain how head and flow is measured in small hydro power conversion? Describe its energy equation. [10]  
b) Briefly describe the principle and limitations of tidal power generation? [6]
7. a) Briefly explain the different types of bio-gas plants with its schematic diagrams. [10]  
b) Describe the importance of earthquakes and volcanoes in the formation of geothermal resources. [6]