Code No: **RT41021** **R13** **Set No. 1**

IV B.Tech I Semester Supplementary Examinations, February - 2019

RENEWABLE ENERGY SOURCES AND SYSTEMS

(Electrical and Electronics Engineering)

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 the terms Altitude angle and Zenith angle pertaining to Solar-Earth geometry. [4]
   b) Give the application of Concentrating type Solar Energy Collectors. [4]
   c) Calculate the number of 36 V, 10A PV modules required to supply a dc load at 400V and 40A. [4]
   d) What is lift- to- drag ratio for a wind turbine. [4]
   e) Identify different types of turbines for hydel power plants. [3]
   f) What are the factors which determine the efficiency of a fuel cell? [3]

PART–B *(3x16 = 48 Marks)*

2. a) Discuss the factors attenuating the solar radiation on the earth's atmosphere. [8]
   b) Determine the Local solar time and declination at a location latitude 23^0 15' N, longitude 77^0 30' E at 12.30 PM IST on June 19. time correction = -(1' 01"). [8]

3. a) Describe each component of Liquid heating Flat-plate collector. [8]
   b) Describe Transmittance- Absorptance Product of a Flat-plate collector. [8]

4. a) Explain the principle of photo-voltaic effect with neat sketches. [8]
   b) Describe the Perturb & Observe method of tracking maximum power transfer from PV array. [8]

5. a) Discuss different types of horizontal-axis turbines. [8]
   b) Derive the expression for maximum wind power extracted by a wind turbine. [8]

6. a) A Pelton wheel is to be installed in a site with H = 20m, Q_{min}=0.05m3 $s^{-1.}$ Neglecting friction, find (i) the jet velocity (ii) the maximum power available (iii) the radius of the nozzles (assuming there are two nozzles). Assuming that the wheel has shape number= 0.1 find (iv) the number of cups (v)the diameter of the wheel (vi) the angular speed of the wheel in operation. [8]
   b) Describe in detail the operation of double basin type tidal power plant. [8]

7. a) Differentiate between the following methods of biogas generation
   i. Pyrolysis ii. Combustion iii. Gasification iv. Anaerobic Digestion. [8]
   b) Describe all the types of geo-thermal resources with their applications. [8]