Code No: 135CU **R16**

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, May/June - 2019
NON-CONVENTIONAL POWER GENERATION
(Common to CE, ME, ECE, CSE)

Time: 3 hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

Illustrate your answers with NEAT sketches wherever necessary.

PART - A

(25 Marks)

1.a) Define 'Surface azimuth angle' and 'Solar azimuth angle'. [2]
b) What are solar ponds? Explain its principle of working. [3]
c) Name the basic components of Photovoltaic systems. [2]
d) Explain briefly the three processes required to obtain useful power output from photon interaction in a semi-conductor? [3]
e) How can the wind utilization be considered as a part of solar energy? [2]
f) Distinguish between pitch control and yaw control in wind energy conversion systems. [3]
g) What is the difference between biomass and biogas? [2]
h) What are limitations of the flashed-steam geothermal system as compared to the vapour-dominated system? [3]
i) Explain the two approaches to hardness tidal energy. [2]
j) What are the main components of a fuel cell system? Show by means of a schematic diagram. [3]

PART - B

(50 Marks)

2.a) Explain, with sketches, the various types of solar radiation measurement instruments.
b) Calculate the number of daylight hours (sunshine hours) at Bangalore on 21st June and 21st December in a leap year. The latitude of Bangalore is $12^0 58'$ N. [5+5]

OR

3.a) Derive an expression for total radiation on an inclined surface. Show that a horizontal surface receives no ground reflected radiation.
b) Discuss the following terms: Diffuse radiation, Reflected radiation and Total radiation. [5+5]

4. What is Maximum Power Point Tracker (MPPT)? Also discuss the three possible strategies for operation of a Maximum Power Point Tracker. [10]

OR

5.a) A solar photovoltaic panel has an open circuit voltage of 43.6V and short circuit current of 5.45A. The maximum power that can be drawn from the panel is 175W. The maximum power occurs at a voltage of 81% of open circuit voltage. What is the optimal load resistance that needs to be connect to the terminals of the PV panel?

b) With a schematic diagram, describe the working of a basic photovoltaic system for power generation. [5+5]

6.a) Derive an expression for power extracted from wind.

b) A horizontal axis wind turbine is installed at a location having free wind velocity of 15 m/s. The 80 m diameter rotor has three blades attached to the hub. Find the rotational speed of the turbine for optimal energy extraction. [5+5]

OR

7.a) State and briefly explain the factors that determine the output power from wind energy.

b) Write a technical note on selection of generator for WECS. [5+5]

8.a) Sketch and explain the working of floating gas holder type biogas plant (KVIC) plant used in India.

b) Explain the concept of wet steam geothermal system. [5+5]

OR

9.a) Discuss the significant factors effecting of aerobic digestion and anaerobic digestion.

b) Classify wet and dry process of energy conversion technologies. [5+5]

10.a) What is the significance of a fuel cell? Write short notes on regenerative fuel cell and list out its advantages.

b) The basin area of a tidal power plant is 20×10^6 m^2. The tidal range is 8 m. Calculate the energy generated in kWh. [5+5]

OR

11.a) Mention the application of fuel cells and explain anyone application.

b) Distinguish between working principles of a single basin and double basin systems of tidal power plants. [5+5]

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