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

IV B.Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018

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) Explain about extra terrestrial radiation in brief. [3]
   b) Distinguish between flat and concentrating collectors. [4]
   c) Draw the I-V characteristic of a solar cell. [3]
   d) What are the advantages of wind energy conversion system? [4]
   e) What are limitations of micro hydro-electric power stations? [4]
   f) What are the different types of fuel cells? [4]

PART–B *(3x16 = 48 Marks)*

2. a) Explain briefly about the different parameters that describes the amount of solar energy reaching the earth surface? [8]
   b) Calculate the angle of incidence of beam radiation on a surface located at New Delhi, at 1:30 (Solar time) on 20 March, if the surface is tilted 45^0 from the horizontal and pointed 30^0 west of South. [8]

3. a) By defining various parameters, explain transmissivity based on reflection and refraction? [8]
   b) Describe various types of solar air heaters with neat schematic diagrams in brief. [8]

4. a) What are the different considerations of PV modules to be connected in series and parallel for deciding PV system design? [8]
   b) Explain the necessity of using maximum power point tracking with the help of P-V and I-V curves and describe on which factors efficiency of PV cell depends? [8]

5. a) Explain how the wind energy systems (WECS) are classified? Discuss in brief? [8]
   b) Explain different schematics of wind power generation using induction generator as an option? [8]

6. a) Describe different types hydro turbines that can work with larger water flow? [8]
   b) Explain various advantages and disadvantages of tidal energy generation system? [8]

7. a) What are the reactions phases that take place in a digester, explain them in detail? [8]
   b) Describe working principle of fuel cell with neat sketch and draw the performance characteristics of hydrogen-oxygen fuel cell? [8]

Code No: **RT41021** **R13** **Set No. 2**

IV B.Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018

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
*****

PART–A *(22 Marks)*

1. a) Explain terrestrial solar radiation assuming air mass zero? [3]
   b) What is the principle of working of solar pond? [4]
   c) Draw the typical power-voltage characteristics of a solar cell under varying input conditions. [4]
   d) Define tip speed ratio in the wind energy conversion system? [3]
   e) What are the advantages of small hydro-electric power stations? [4]
   f) What are the various prospects of geothermal energy? [4]

PART–B *(3x16 = 48 Marks)*

2. a) What is declination angle? Explain seasonal variation in the declination angle? [8]
   b) Calculate the number of daylight hours (sunshine hours) in Delhi on 20th June and azimuth angle New Delhi at 2.30 pm on 20th February? [8]

3. a) Express heat lost from collector in terms of overall loss coefficient? Explain bottom loss coefficient in detail? [10]
   b) Explain the advantages of solar water heater with respective to conventional water heaters. [6]

4. a) Explain balance of system components in the PV system application? [8]
   b) How the maximum power is tracked from solar pv systems explain any method? [8]

5. a) Show that ideal maximum power coefficient is 0.59 for a horizontal axis windmill? [8]
   b) Explain different types and characteristics of windmill rotors with relevant diagrams? [8]

6. a) Describe principle of flow rate Q measurement and explain any one method. [8]
   b) Describe how wave energy is extracted from the surface wave of deep water? [8]

7. a) Explain in detail about anaerobic digestion and the different phases involved in this process? [8]
   b) Explain working principle of fuel cell and describe energy storage system using fuel cells? [8]

Code No: **RT41021** **R13** **Set No. 3**

IV B.Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018

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
*****

PART–A *(22 Marks)*

1. a) Explain extraterrestrial solar radiation assuming air mass zero? [3]
   b) What is principle of working of solar air heater? [4]
   c) Draw the equivalent circuit of solar cell, how do you obtain its simplified circuit? [4]
   d) What is meant by cut-in speed in wind energy conversion system? [3]
   e) What are the economic aspects of small hydro-electric power stations? [4]
   f) Explain the characteristics of hydrogen-oxygen fuel cell? [4]

PART–B *(3x16 = 48 Marks)*

2. a) Describe in brief different empirical relations which predict the availability of solar radiation? [8]
   b) Calculate the hour angle at sunrise and sunset on plane surface tilted at an angle of 20^0, given that $\varphi = 28^0 N, \delta = -21^0$ and $\gamma = 48^0$ [4]
   c) Calculate the angle made by the beam radiation with normal to the flat plate collector on February 20, at 12.00 h (local apparent time), the collector is located at New Delhi (28^0 35' N, 77^0, 12'E). [4]

3. a) Deduce the expression for heat gain rate in a collector and hence obtain collector heat removal factor? [8]
   b) Draw the schematic and give functional description of solar pond in detail? [8]

4. a) Explain the effect of radiation intensity and temperature on short circuit current, open circuit voltage and power generated in PV cell? [8]
   b) Draw the electrical layout of a typical solar PV system, state the functions of essential equipment? [8]

5. a) Explain principles of wind energy conversion and describe factors affecting wind speed? [8]
   b) Describe salient features of horizontal axis and vertical axis wind turbines? [8]

6. a) Describe principle of working of reaction turbine? Briefly describe about different types reaction turbines? [8]
   b) Explain about small Hydro electric scheme with a neat layout diagram. [8]

7. a) Explain working principle of fuel cell and describe energy storage system using fuel cells? [8]
   b) Describe principle of geo-thermal energy? What are the limitations of harnessing geo-thermal energy? [8]

Code No: **RT41021** **R13** **Set No. 4**

IV B.Tech I Semester Regular/Supplementary Examinations, Oct/Nov - 2018

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
*****

PART–A *(22 Marks)*

1. a) What is meant by local apparent time for calculating hour angle? [3]
   b) What are the various types and arrangements of solar air heaters? [4]
   c) Explain the factors that are considered for pv system design. [4]
   d) What is meant by cut-out speed is in wind energy conversion system? [3]
   e) What are the disadvantages of small hydro-electric power stations? [4]
   f) Why does water in geothermal acquifer remain in the liquid state? [4]

PART–B *(3x16 = 48 Marks)*

2. a) What is declination angle? Find the value of this angle on March 21st and December 31st? [8]
   b) Derive expression for the daily extraterrestrial radiation which falls on the surface having a slope β and facing south? [8]

3. a) Express heat lost from collector in terms of overall loss coefficient? Explain top loss coefficients in detail? [8]
   b) Draw the schematic and give functional description of cylindrical parabolic collector? [8]

4. a) Derive an expression for efficiency and power produced by PV cell? Describe effect of cell temperature on cell efficiency? [8]
   b) Explain hill-climbing method of maximum power extraction in PV system in detail? [8]

5. a) List and explain the different types of turbines considered in wind energy system. [8]
   b) Explain different parameters which are required in the extraction of maximum power under varying wind speed conditions? [8]

6. a) What is a tidal power plant and what factors are considered in order to install it? [8]
   b) Describe the wave power basic theory and obtain equation for its kinetic energy? [8]

7. a) What are the different factors which affect the size of the bio gas plants? [8]
   b) Describe various advantages and disadvantages of geothermal energy forms? [8]