Code No: R1631022 **R16** SET - 1

III B.Tech I Semester Regular/Supplementary Examinations, October/November - 2019

RENEWABLE ENERGY SOURCES

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART-A (14 Marks)

1. a) Explain in brief about Local Solar time or local Apparent time. [3M]
   b) What do you mean by a passive Solar space heating system? [2M]
   c) List the various materials used in making a Solar Cell. [2M]
   d) Name the device used to measure the Wind Speeds and on what effect will it work? [2M]
   e) Distinguish between tidal, Ocean thermal and Wave Energy. [3M]
   f) Classify Geothermal Sources. [2M]

PART-B (56 Marks)

2. a) List the advantages and limitations of renewable energy sources. [7M]
   b) Estimate the daily global radiation on a horizontal surface at Baroda (22^0 $13^{'}$ N, 73^0 $13^{'}$E) during the month of march. If constants *a* and *b* (which depends on the location) are given as 0.28 and 0.48 respectively and average sunshine hours for day are 9.5. [7M]

3. a) Explain the different methods of Sun Tracking. [7M]
   b) With the help of a neat sketch explain about Solar heating system using water heating Solar collectors. [7M]

4. a) Explain the performance characteristics of a Solar Cell. [7M]
   b) A Solar cell has an output capability of 0.5 A at 0.44 V. A series/Parallel solar array has been designed of such cells with 100 parallel strings and each string has 300 cells in series. Calculate: i) Voltage capability; ii) Current capability and, iii) Power output capability of array. [7M]

5. a) List the factors responsible for distribution of wind energy on the surface of the Earth. [7M]
   b) Discuss the aerodynamic considerations in Windmill design. [7M]

6. a) Explain about Micro hydro Power plant with a neat layout. [7M]
   b) List the advantages and disadvantages of Tidal energy. [7M]

7. a) What is meant by anaerobic digestion? List the factors that affect bio digestion. [7M]
   b) Explain the main type of turbines, which may be used for Geothermal energy conversion. [7M]

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Code No: R1631022 **R16** SET - 2

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

RENEWABLE ENERGY SOURCES

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART-A (14 Marks)

1. a) Define solar constant. [2M]
   b) Explain the principle of conversion of solar energy into heat. [2M]
   c) What is the importance of the term fill factor as a performance parameter for a solar cell? [2M]
   d) Define the tip speed ratio of wind turbines. Why it is important? [3M]
   e) Explain the difference between spring and neap tides. [3M]
   f) What benefits may occur if an anaerobic digester is installed at a cattle farm? [2M]

PART-B (56 Marks)

2. a) Explain the different angles that are used in solar radiation geometry. [7M]
   b) Given in detail the comparison between conventional and renewable energy sources. [7M]

3. a) Enumerate the different types of concentrating type collector. Describe a collector used in power plant for generation of electrical energy. [7M]
   b) Explain in detail about the Transmissivity of Cover system. [7M]

4. a) Draw and explain an equivalent circuit of a practical solar PV cell. [7M]
   b) Explain how Hill climbing technique of maximum Power Point technique is used in PV system. [7M]

5. a) Explain the operation of horizontal axis wind mills. [7M]
   b) With usual notations, derive an expression for maximum power output of wind turbine. [7M]

6. a) Describe the different types of turbines are in use for small scale hydroelectric plants. [7M]
   b) What are the advantages and limitations of wave energy conversion? Explain. [7M]

7. a) Explain the constructional details and working of KVIC digester. [7M]
   b) What is a fuel cell? Describe the principle of working of a fuel cell with reference to H_2-O_2 cell. [7M]

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Code No: R1631022 **R16** SET - 3

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

RENEWABLE ENERGY SOURCES

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART-A (14 Marks)

1. a) What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? [2M]
   b) Why orientation is needed in concentrating type collectors? [2M]
   c) Define photo voltaic effect. [2M]
   d) A wind turbine has a rated power of 100 kW and rated speed of 12 m/s. Estimate its power output in a wind speed of 9 m/s. [3M]
   e) Explain the difference in method of operation between an impulse turbine and reaction turbine. [3M]
   f) Name and quantify anaerobic digestion temperature ranges. [2M]

PART-B (56 Marks)

2. a) Explain in detail various forms of renewable energy. [7M]
   b) Determine the average value of solar radiation on a horizontal surface for June 22, at the latitude of 10^0 N, if constants *a* and *b* are given as equal to equal to 0.30 and 0.51 respectively, and the ratio n/N=0.55. [7M]

3. a) What are the advantages and disadvantages of concentrating collectors over flat-plate collectors? Explain. [7M]
   b) What is the main application of a solar pond? Describe briefly. [7M]

4. a) Explain the different conditions on which the PV system performance depends? [7M]
   b) List and explain the different losses that lead to the less efficiency of a Solar cell. [7M]

5. a) What are the most favourable sites for installing of wind turbines? Explain the major applications of wind power. [7M]
   b) Using Betz model of a wing turbine, derive the expression for power extracted from wind. [7M]

6. a) Derive the expressions for P.E and K.E of the wave energy. [7M]
   b) The observed difference between the high and low water ride is 8.5 m, for a proposed tidal site. The basin area is about 0.5 sq. km which can generate power for 3 hrs in each cycle. The average available head is assumed to be 8 m, and the overall efficiency of generation to be 70%. Calculate the power in h.p. at any instant and the yearly power output. Average specific weight of sea water is assumed to be 1025 kg/m^3. [7M]

7. a) Explain how the heat is extracted from hot dry rocks? [7M]
   b) What are the advantages and disadvantages of floating drum plant? Explain. [7M]

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Code No: R1631022 **R16** SET - 4

III B. Tech I Semester Regular/Supplementary Examinations, October/November - 2019

RENEWABLE ENERGY SOURCES

(Electrical and Electronics Engineering)

Time: 3 hours Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
3. Answer any **FOUR** Questions from **Part-B**

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PART-A (14 Marks)

1. a) Explain what the need of alternate energy sources is? [2M]
   b) Write short notes on solar heater. [2M]
   c) Explain the effect of shunt resistance in equivalent circuit of a PV cell. [2M]
   d) A wind turbine has a rated power of 100 kW and rated speed of 12 m/s. Estimate its power output in a wind speed of 18 m/s. [3M]
   e) Briefly explain cavitation that may occur in a reaction turbine. [3M]
   f) Write short notes on applications of fuel cells. [2M]

PART-B (56 Marks)

2. a) Discuss how the average solar radiation is estimated. [7M]
   b) Calculate the angle made by the beam radiation with the normal to a flat-plate collector pointing due south located in New Delhi ($28^0$38'N, $77^0$17'E) at 9:00 hour, solar time on December 1. The collector is tilted at angle of 36^0 with horizontal. [7M]

3. a) Data for a flat plate collector used for heating are given below [7M]

factor	specification
location and latitude	Coimbatore 11^0 00`N
day and time	march 22,14.30 to15.30(IST)
average intensity of solar radiation	560 W/m^2
collector tilt	26^0
number of glass cover	2
heat removal factor for collector	0.82
transmittance of glass	0.88
Absorptance of the plat	0.93
U_L for collector	7.95 W/m^{20}C
collector fluid temperature	75 ^{0}C
ambient temperature	25 ^{0}C

   Calculate:
   (i) solar attitude angle (ii) incident angle (iii) collector efficiency
   b) What is the principle collection of solar energy used in a non-convective solar pond? Describe a non-convective solar pond for solar energy collection and storage. [7M]

4. a) Draw and explain the P-V and I-V characteristics of the PV System for different Input quantities of irradiance and temperature. [7M]
   b) Explain the term fill factor and its importance as a performance parameter for a solar cell. [7M]

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5. a) Wind at 1 standard atmospheric pressure and 15 ^{0}C temperature has a velocity of 10 m/s. The turbine has diameter of 120 m and its operating speed in 40 rpm at maximum efficiency. Calculate: [8M]

   i) The total power density in the wind stream.
   ii) The maximum obtainable power density assuming, efficiency=40%.
   iii) The total power produced (in kW) and
   iv) The torque and axial thrust.

   b) What are advantages of vertical axis machines over horizontal type? Explain. [6M]

6. a) Explain with sketches the various methods of tidal power generation. What are the limitations of each method? [10M]
   b) Write short notes on small head hydro power development. [4M]

7. a) With a neat sketch, explain Janta model digestion plant. [7M]
   b) Explain the working of fuel cell with a neat sketch. [7M]

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