

**III B. Tech I Semester Regular Examinations, October/November - 2018****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****PART -A**

1. a) Distinguish between the term irradiance and irradiation. [2M]
- b) What do you understand by Solar thermal Energy? [2M]
- c) Distinguish between a Solar cell, Module, Panel and Array. [2M]
- d) Explain the variation of Wind speed with consideration of height from the ground. [3M]
- e) Give the classification of small hydro Power stations. [3M]
- f) What are the various losses occurring in the fuel cell? [2M]

**PART -B**

2. a) Explain the following terms used in Solar radiation analysis: [7M]  
i) Hour angle ii) Solar azimuth angle iii) Declination angle
- b) Explain the terms extraterrestrial radiation and terrestrial radiation w.r.t solar radiation. [7M]
3. a) Explain in detail about the Flat plate Collectors and give its advantages and Disadvantages. [7M]
- b) Draw the schematic diagram for Solar pond based electric plant along with its working. [7M]
4. a) Derive an expression for efficiency and power produce by PV cell. Explain the various factors that affect the performance of cell. [7M]
- b) Explain the significance of Perturb and Observe MPPT method and how it can realized. [7M]
5. a) Find the tip – speed ratio if a 6 m diameter rotor has rotation of 20 rpm and the wind speed is 4 m/s. What is the implication of tip speed ratio? [7M]
- b) Discuss the aerodynamic considerations in wind mill design in detail. [7M]
6. a) Explain the basic components of Tidal Power Plants and give their significance. [7M]
- b) List the advantages and limitations of Small scale Hydroelectric Units. [7M]
7. a) Explain the current – voltage characteristics of Fuel Cell and give its Significance. [7M]
- b) What are the advantages and disadvantages of geothermal energy? [7M]

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**PART -A**

1. a) Distinguish between Conventional resources and Non-conventional sources. [2M]
- b) What are Solar thermal Energy applications? [2M]
- c) What is the depletion layer in p – n junction? [2M]
- d) List the factors responsible for distribution of wind energy on the surface of the earth? [3M]
- e) Explain the basic principle of Tidal Power. [3M]
- f) List the various Biomass Resources. [2M]

**PART -B**

2. a) Explain in detail about the Beam radiation and diffuse radiation. [7M]
- b) Determine the Local Apparent Time corresponding to 1500 h (IST) Mumbai ( $19^{\circ}07'$ ,  $75^{\circ}51'$  E) on 1 July. In India, IST is based on  $82.50^{\circ}$  E. On 1 July, equation of time correction is equal to  $-4$ . [7M]
3. a) Compare between the concentrating collector over Flat collector. [7M]
- b) Explain the working of Solar Water heater with component based diagram. [7M]
4. a) Explain the effect of radiation intensity and temperature on the short circuit current, open circuit voltage and power generated by PV cell. [7M]
- b) Explain with a neat algorithm of Hill climbing MPPT Technique and give its merits. [7M]
5. a) Explain Betz model of expanding air stream tube to determine extraction of wind energy by windmill. [7M]
- b) Explain the working of Wind Energy Conversion System (WECS) with main components. [7M]
6. a) Explain the basic components of Small hydroelectric scheme with a layout arrangement. [7M]
- b) Derive an expression for Power generated by a Tidal System. [7M]
7. a) Explain the principle of working of a  $H_2 - O_2$  fuel cell. [7M]
- b) Explain about dry, wet and Hot water geo thermal systems? [7M]

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1. a) List the different forms of Renewable Energy sources. [2M]
- b) Enumerate the different types of Concentrating Solar collectors. [2M]
- c) Draw and explain briefly about equivalent circuit of a Solar cell. [2M]
- d) What are the relative features of drag and lift type machines in Windmills. [3M]
- e) List the difficulties in tidal power developments. [3M]
- f) Explain the various characteristics of Fuel cell. [2M]

**PART -B**

2. a) What do you understand by Solar radiation data? What is the need of Solar radiation data? [7M]
- b) Calculate the number of day light hours in Srinagar for 1 January and 1 July. [7M]  
Take latitude of Srinagar as  $34^{\circ}05'$  N.
3. a) Explain the significance of following factors in Flat Plate collectors: [7M]  
i) Fin efficacy factor ii) Collector heat removal factor.
- b) Explain the working of a Solar furnace with the help of a neat sketch. [7M]
4. a) Explain the various factors contributing to losses in Solar cell. How is the efficiency reduced due to these factors. [7M]
- b) Explain the PV system configuration and signify the importance of the converter circuit and MPPT block in it. [7M]
5. a) Derive an expression for the total power of a wind stream taking in to all considerations m/sec, air density as. [7M]
- b) Find the maximum power output of a turbine if wind speed is 10 m/sec, air density as  $1.4 \text{ Kg/m}^3$  and rotor diameter as 64 m. [7M]
6. a) List the advantages and limitations of Tidal power generation. [7M]
- b) Explain how the electric power is generated from hydro Power with necessary equations. [7M]
7. a) Explain the process of Single stage gasifier in detail. [7M]
- b) Compare between Geothermal Power plant and Conventional thermal Power plant. [7M]

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1. a) List the various applications of PV system? [2M]
- b) Explain the working of a solar thermal pump. [2M]
- c) What do you understand by Valence band, Conduction band and Forbidden band w.r.t. a semiconductor. [2M]
- d) How can windmills be classified? [3M]
- e) List the advantages of Small hydro power. [3M]
- f) Explain the process of Photosynthesis. [2M]

**PART -B**

2. a) Define Solar constant. What are the reasons for variation in solar radiation reaching the earth and that received outside the earth atmosphere? [7M]
- b) Calculate the i) Zenith angle and ii) Solar azimuth angle for a place with latitude  $43^\circ$  at 9.30 AM solar time on Feb 13. [7M]
3. a) Explain the different factors that affect the performance of a Flat plate collector. [7M]
- b) A cylindrical parabolic concentrator is 9 m long and 2 m wide. The diameter of absorber tube is 10 cm. Find the concentration ratio. [7M]
4. a) Explain the current – voltage characteristics of a Solar cell and define Fill factor and give its significance. [7M]
- b) Explain the significance of Maximum Power Point Tracking and explain any one technique in detail. [7M]
5. a) List the main considerations for selecting a site for wind generator. [7M]
- b) Explain the variation of output of a wind turbine with tip speed ratio of the rotor. [7M]
6. a) Explain the different types of turbines that are used in Small scale hydroelectric power generation. [7M]
- b) What are the site requirements to construct a Tidal Power Plant? [7M]
7. a) List the advantages, disadvantages and environmental impacts of Biomass. [7M]
- b) What is meant by geothermal energy? Why it is called renewable energy? [7M]
- What are the deciding factors to use in power generation?