

Code No: R42025

**R10****Set No. 1****IV B.Tech II Semester Regular/Supplementary Examinations, April/May – 2016****NON-CONVENTIONAL SOURCES OF ENERGY****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions  
All Questions carry equal marks****\*\*\*\*\***

- 1 a) What is a solar constant? What is the difference between extraterrestrial and terrestrial solar radiations? Give reasons for the difference. [8]  
b) Calculate the number of daylight hours (sunshine hours) in Srinagar on January 1 and July 1. The latitude of Srinagar is  $34^{\circ}05'$ . [7]
- 2 a) Compare the performance of various types of solar collectors. How is focusing accomplished in paraboloid dish collector? [8]  
b) Determine the intercept factor and concentration ratio for a paraboloidal concentrator and receiver for an axially symmetrical system with aperture radius  $R$  and radius of absorber in focal plane,  $r$ , and  $R/r = 0.01$  and normal flux distribution coefficient,  $h = 60$ . [7]
- 3 a) Explain the principles of wind power generation by deriving the following expression.  
$$P = \eta \frac{AV_i^3}{2}$$
 [10]  
b) Explain the problems associated with the wind power. [5]
- 4 a) Draw the equivalent circuit of solar cell along with its I-V characteristics showing the peak power line. [8]  
b) Write a technical note on battery energy storage system. [7]
- 5 a) What are the biomass conversion technologies? Draw a schematic diagram to explain various conversion technologies and products. [10]  
b) List out the problems involved with biogas production. [5]
- 6 a) How is geothermal energy generated inside the earth crust? In India where is geothermal energy is available? [8]  
b) Explain with neat sketch, the operation of a geothermal power plant. [7]
- 7 a) What is Ocean thermal energy? Discuss its availability. [8]  
b) What are the limitations and applications of OTEC plants? [7]
- 8 Derive an expression for emf, free energy, potential, power output and efficiency of a fuel cell. Give its applications [15]

Code No: **R42025****R10****Set No. 2****IV B.Tech II Semester Regular/Supplementary Examinations, April/May – 2016****NON-CONVENTIONAL SOURCES OF ENERGY****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions****All Questions carry equal marks**

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- 1 a) Define the following terms: (i) Altitude angle (ii) Zenith Angle (iii) Hour angle [8]  
b) Calculate the number of daylight hours (sunshine hours) at Bengaluru on 21 June and December in a leap year. The latitude of Bengaluru is  $12^{\circ}58'N$ . [7]
- 2 a) How the optical efficiency of a solar collector be estimated? [8]  
b) Describe the application of solar energy for the solar refrigeration. [7]
- 3 a) Give the detailed classification of wind machine. Explain anyone type of wind machine with neat sketch. [8]  
b) Derive the expression for power coefficient of wind mills. Plot the power coefficient Vs speed ratio. [7]
- 4 a) Draw the schematic diagram of the solar array connected to a DC load in a stand-alone system. [8]  
b) Explain how the maximum power can be tracked from wind power systems. [7]
- 5 a) Classify biogas plant and explain anyone type of biogas plant with neat sketch [8]  
b) Discuss the application of bio-gas in internal combustion engines. [7]
- 6 a) Write a short note on geothermal energy? Classify various types of geothermal energy systems. [10]  
b) Why does water in geothermal aquifers remain in the liquid state even though its temperature may be much higher than  $100^{\circ}C$ ? [5]
- 7 Discuss the theory and working principle of ocean thermal energy conversion system. Also mention its limitations and applications. [15]
- 8 Write a short note on  
i) thermodynamic aspects of direct energy conversion  
ii) Carnot cycle  
iii) Faraday's laws [15]

Code No: **R42025****R10****Set No. 3****IV B.Tech II Semester Regular/Supplementary Examinations, April/May – 2016****NON-CONVENTIONAL SOURCES OF ENERGY****(Electrical and Electronics Engineering)****Time: 3 hours****Max. Marks: 75****Answer any FIVE Questions****All Questions carry equal marks**

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- 1 a) Define solar irradiance, solar constant, extra-terrestrial and terrestrial radiations? What is the standard value of solar constant? [8]  
b) Calculate the angle made by beam radiation with the normal to a flat collector on December 1 at 9.00 AM. Solar time for location at 28°35' N. The collector is tilted at an angle of latitude plus 10°, with the horizontal and is pointing due south. [7]
- 2 a) Describe the principle and applications of solar ponds. [8]  
b) Describe the application of solar energy photovoltaic energy conversion. What are the limitations? Suggest steps to overcome its demerits. [7]
- 3 a) Discuss in detail the operation and control of a wind turbine. How the variations of wind velocity and directions are taken care. [8]  
b) Draw the electrical layout of a typical wind form by means of single line diagram. State the essential equipment. [7]
- 4 a) Explain how the maximum power can be tracked from solar power systems. [8]  
b) Explain the various types of charge regulators for batteries. [7]
- 5 a) What are the main advantages and disadvantages of bio-mass energy? Explain the process of photosynthesis. [8]  
b) Classify biogas plants and explain anyone type of bio-gas plant with neat sketch. [7]
- 6 a) What is the principle of geothermal power generation? What are the limitations of harnessing Geo-thermal energy? [10]  
b) What principles guide in the location of a geothermal power station? [5]
- 7 a) How can ocean temperature differences be estimated? [8]  
b) Discuss the special applications of OTEC plants. [7]
- 8 Explain the construction and working principle of fuel cell with neat sketch. Draw the performance characteristics of hydrogen-oxygen fuel cell. [15]

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- 1 a) Explain the depletion process of solar radiation as it passes through the atmosphere to reach at the surface of the earth. [8]  
b) Calculate total radiation at an inclined surface, facing due south, tilted at  $30^\circ$  with horizontal, at a location in a city, with latitude  $28^\circ 51'$  on January 1 at 12 noon (solar time). The reflection coefficient of the ground,  $\rho$  is 0.2. Also calculate the values of  $R_b$ ,  $R_r$ ,  $R_d$  and  $R'$ . [7]
- 2 a) How is the performance of a flat plate collector evaluated? [8]  
b) Describe the principle of solar photovoltaic energy conversion. [7]
- 3 a) Explain the principle and application of wind electric system. State the basic Components and their working in wind electric system. [10]  
b) Write the specifications of windmills for power generation. [5]
- 4 a) Explain how the maximum power can be tracked from wind power systems. [8]  
b) A small household-lighting system is powered from a nominally 8V (i.e. four cells at 2 V) storage battery having a 30 Ah supply when charged. The lighting is used for 4.0 h each night at 3.0 A. Design a suitable photovoltaic power system that will charge the battery from an arrangement of Si solar cells.  
i) How will you arrange the cells?  
ii) How will the circuit be connected?  
iii) How will you test the circuit and performance? [7]
- 5 a) Discuss briefly the types of bio-gas plant. How bio-energy may be useful for rural application. Justify your answer. [8]  
b) Explain the process of anaerobic fermentation. List the advantages. [7]
- 6 a) Why hot spots are important in harnessing Geo-thermal energy? [5]  
b) What are the different types of geothermal resources? Discuss the prospect of geothermal energy. [10]
- 7 Discuss the theory and working principle of ocean thermal energy conversion system. Also list various plants based upon it. [15]
- 8 a) Explain the principles of direct energy conversion. [8]  
b) Write a technical note on polarization in fuel cells. [7]