Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 90473

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2019

Fifth Semester

Aeronautical Engineering

ORO 551 : RENEWABLE ENERGY SOURCES

(Common to Agriculture Engineering/Automobile Engineering/Industrial Engineering/Industrial Engineering and Management/Materials Science and Engineering/Mechanical Engineering/Medical Electronics/Chemical Engineering/Chemical and Electrochemical Engineering/Fashion Technology/ Food Technology/Handloom and Textile Technology/Pharmaceutical Technology/ Textile Chemistry/Textile Technology/Biomedical Engineering/Civil Engineering/ Electronics and Communication Engineering/Electronics and Telecommunication Engineering/Environmental Engineering/Manufacturing Engineering/Marine Engineering/Petrochemical Engineering/Production Engineering/Bio-Technology/ Petrochemical Technology/Petroleum Engineering)

(Regulations 2017)

Time : Three Hours Maximum : 100 Marks

Answer ALL questions.

PART – A (10×2=20 Marks)

1. What is the difference between Renewable and Non-Renewable Sources of energy ? Give examples.
2. Explain what is Solar Constant.
3. What is Solar Collector ? What are different types of Collectors used ?
4. State the usage of various types of concentrating collectors.
5. When the Solar Distillation and dryers are used ?
6. What is Solar cell ? What are the uses of solar cells ?
7. How winds are formed ? State various applications of Wind Energy.
8. How Bio-gas is obtained ? What is the composition of Bio-gas ?

9. What is OTEC technology ? Which Thermodynamic Cycle is used in OTEC ?

10. Which of the disadvantages of the current power generator system can be overcome by DEC devices ? What are these DEC devices ?

PART – B **(5×13=65 Marks)**

11. a) What is beam , diffuse and global radiation ? Which instruments are used for the measurement of these radiation ? Explain working of Solar Pyranometer for measuring Global Radiation in detail.

(OR)

b) What is the need for studying alternative sources of Energy ? What are the different types of New and Renewable Sources of Energy ? What are the advantages and limitations of the use of Renewable Sources of Energy ?

12. a) Explain the working of Flat Plate collector used in Solar Water Heating System using Thermosyphon method with the help of a neat sketch. How the orientation and Angle of Tilt of the Flat Plate collector is decided ? What are the advantages of Flat Plate collector system ?

(OR)

b) For what applications Concentrating collectors are used ? Explain the working of Cylindrical Parabolic Concentrator with help of neat sketch. What are the terms 'Tracking' and 'Concentration Ratio' in this concentrator means ?

13. a) In which applications Solar Energy Storage is required and when it is not required ? Explain briefly various methods of Thermal Energy Storage. List the considerations which determine the selection of method of storage.

(OR)

b) What are the applications of Solar Pond ? With the help of neat sketch explain the working and application of Solar Pond ? What are the operational problems associated with its operation and maintenance ?

14. a) What is Bio-mass ? What are various principles of Bio-Conversion and their energy products ? Explain the working of fixed Dome type Biogas Plant with the help of neat sketch. What are the properties of Biogas ? What are the advantages and disadvantages of using Biogas as a fuel ?

(OR)

b) What are the advantages and disadvantages of Wind Energy Conversion ? How wind mills are classified ? What are the basic components of Wind mills ?

15. a) What is the Geothermal Energy ? What are the various methods of harnessing this energy ? What is the potential of Geothermal Energy in India ?

(OR)

b) What is the basic principle of Tidal Energy ? Explain the Principle of working of Simple Tidal Energy Conversion Plant with the help of a neat sketch. What is the status of Tidal Power Plants in the world and in India ?

PART – C **(1×15=15 Marks).**

16. a) A flat Plate solar thermal collector is installed on the roof of a hotel in New Delhi (latitude $\Phi = 28.58°N$). The collector surface of 10 m^2 area is pointing towards south with angle of 30° with horizontal.

a) The angle of incidence of sunlight (θ) is to be calculated for First December at Local Apparent Time of 9 AM. (Corresponding hour angle $\omega = 45°$)

b) With power density of 0.6kW/m^3, what is the power collection at the said time ?

c) The water tank of the thermal system contains 1000 kg of water, initially at 30°C. What will be the temperature of water after 1 hour assuming constant power collection of (b) ?

(OR)

b) A horizontal shaft, propeller type wind-turbine is located in area having Speed of wind 10 m/s at 1 atm and 15°C. Calculate the following :

a) Air density ρ, kg/m^3.

b) Total power density in wind stream, W/m^2.

c) Maximum possible obtainable power density, W/m^2.

d) Actual obtainable power density, W/m^2.

e) Total power from the wind-turbine of 120 m dia.

f) Torque and axial thrust (Na) on the wind-turbine operating at 40 rpm and at maximum efficiency of 42%.