



## P.E.S. College of Engineering, Mandya - 571 401

(An Autonomous Institution affiliated to VTU, Belagavi)

**Eighth Semester, B.E. - Mechanical Engineering**

**Semester End Examination; June - 2017**

**Renewable Energy Sources**

*Time: 3 hrs*

*Max. Marks: 100*

**Note:** i) Answer **FIVE** full questions, selecting **ONE** full question from each unit.

ii) Missing data, if any, may be suitably assume.

### UNIT - I

- 1 a. Write a descriptive note on the current energy scenario of conventional and non-conventional energy sources with respect to Indian context. 6
- b. What is energy conversion? Compare renewable and non-renewable energy sources. 8
- c. State the advantages and limitations of non-conventional sources of energy. 6
- 2 a. With a neat sketch explain spectral distribution of solar radiation geometry. 5
- b. Write a note on the following: 15
- i) Solar radiation data      ii) Beam and diffuse radiation      iii) Insulation.

### UNIT - II

- 3 a. Differentiate between pyrheliometer and pyranometer. 6
- b. With a neat sketch describe the principle of angstrom type pyrheliometer. 6
- c. Calculate the local apparent time (LAT) corresponding to 13.30 hrs (IST) on July 16 at a location Latitude  $28^{\circ}35'N$ , Longitude  $77^{\circ} 12'E$ . The equation of the time correction on July 16 is (-6) Minutes. Indian standard time (IST) as the local Civil time corresponding to  $82.5^{\circ}$  E longitude. Also calculate the declination. 8
- 4 a. With a neat sketch define the following : 15
- i) Latitude      ii) Delineation angle      iii) Surface azimuth angle
- iv) Hour angle      v) Zenith angle      vi) Solar altitude angle.
- b. Explain with neat sketch, the working principle of sunshine recorder. 5

### UNIT - III

- 5 a. Describe the principle of energy conversion in a flat plate collector. With neat labeled diagram discuss the function each component of it. 10
- b. With neat diagram explain working principle of a solar pond and draw a temperature and concentration profile for a typical solar pond. 10
- 6 a. Explain with neat diagram working of a solar power generation system. 6
- b. Explain the working principle with schematic diagram of any two concentrating collectors. 8
- c. With a neat sketch and T-S diagram, explain the working principle of vapour dominated geothermal system. 6

**UNIT - IV**

- 7 a. List the various types of wind mill and explain any one type from horizontal axis and vertical axis wind mill. 10
- b. List out major problems associated with wind power generation. 6
- c. Explain the principle of OTEC system. 4
- 8 a. Wind at 1 standard atmosphere pressure and 15°C. temperature has a velocity of 10 m/s the turbine has diameter of 120 m and its operating speed of 40 rpm, at maximum efficiency calculate; 10
- i) The total power density in the wind stream
- ii) The maximum obtainable power density assuming efficiency of 40%.
- iii) The total power produced and torque.
- b. Explain method of harnessing tidal energy using the double barin system. 6
- c. Explain problems associated with OTEC 4

**UNIT - V**

- 9 a. Explain the principle of operation of KVIC biogas digester with a neat sketch. 10
- b. Explain the process of anaerobic fermentation. List the advantages. 10
- 10 a. Explain the production of hydrogen by thermal decomposition of water. 6
- b. What are the various methods of hydrogen storage briefly explain. 8
- c. Why hydrogen is more versatile fossil fuels? State merits and demerits of hydrogen energy. 6

\* \* \* \*