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

***(An Autonomous Institution affiliated to VTU, Belgaum)***

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

**Semester End Examination; June - 2016**

**Non-Conventional Energy Sources**

*Time: 3 hrs* *Max. Marks: 100*

***Note**: Answer any **FIVE** full questions, selecting atleast **TWO** full questions from each part.*

**PART - A**

1 a. What is energy conversion? Briefly explain any four different non-conventional energy sources. 10

b. State advantages and disadvantages of non-conventional energy sources. 6

c. What do you mean by Biomass and state the benefits of using Biomass as energy source. 4

2 a. Explain solar radiation at earth's surface. 6

b. Differentiate Pyrheliometer and Pyranometer. 6

c. Define the following terms with help of diagram : 8

i) Altitude angle ii) Zenith angle iii) Azimuth angle.

3 a. Determine the local solar time and declination at a location 23°15′ N, 76°30′ E at 12.30 IST on June 29. Equation of time correction is given from standard table is -1°01″. Take standard time longitude as 81°30′ E. 8

b. Calculate the monthly average hourly radiation falling on a flat plate collector facing south ($\gamma = 0°$) with slope of 15° given following data : 12

Location – Madras [13°00′ N],

Month – October $15^{th}$ ,

Time - 1100-1200 h [LAT]

$I_g$ – 2408 kJ/$m^2$-h,

$I_d$ – 1073 kJ/$m^2$h

Assume reflectivity – 0.2.

4 a. Explain different types of concentrating collectors. 10

b. Explain with sketches the principle of solar pond. 5

c. Describe the principle construction of flat plate collector. 5

**PART -B**

5 a. Wind at 1 standard atmospheric pressure and 15°C has velocity of 15 m/s, calculate : 10

i) The total power density in wind stream.

ii) The maximum obtainable power density.

iii) Total power produced and torque.

Take turbine diameter is 120 m, operating speed of 40 rpm and for air R = 0.287 kJ/kgK.

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| b. | With neat sketch explain horizontal axis type wind mill. Mention its advantages and disadvantages. | 10 |
| 6 a. | Explain the method of harnessing tidal energy using single basin system. | 8 |
| b. | Explain with neat sketch the closed OTEC cycle. | 8 |
| c. | Discuss the limitations of OTEC. | 4 |
| 7 a. | Discuss the problem associated with Geothermal conversion system. | 6 |
| b. | Explain the principle of operation of a KVIC biogas digester with a neat sketch. | 10 |
| c. | Discuss the advantages and disadvantages of biogas conversion system. | 4 |
| 8 a. | Explain with neat sketch the working principle of fuel cell and state its advantages and disadvantages. | 10 |
| b. | Write a short notes on following :<br>i) Vertical axis wind mills.<br>ii) Angstron type Pyreheliometer. | 10 |

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