

**DIPLOMA IN MECHANICAL ENGINEERING
(DMEVI)**

**Term-End Examination
December, 2013**

**BIMEE-003 : NON-CONVENTIONAL ENERGY
RESOURCES**

Time : 3 hours

Maximum Marks : 70

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- Note :** (i) *Attempt any five questions.*
(ii) *Standard notation and symbols have usual meaning.*
(iii) *Assume suitably any missing data.*
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1. (a) Define surface azimuth angle (γ), solar azimuth angle (γ_s) and zenith angle (θ_z). **4**
- (b) Calculate the monthly average hourly radiation falling on a flat plate collector facing south ($\gamma = 0$) with slope of 15° , given the following data. **10**
- Location - Chennai ($13^\circ 00' N$)
Month - October
Time - 1100 - 1200 h (LAT)
 \bar{I}_g - 2408 KJ/m²-h
 \bar{I}_d - 1073 KJ/m²-h
- Assume ground reflectivity to be 0.2

2. Design a PV system for pumping 25000 litres of water everyday from a depth of about 10 meters with operating factor of PV module = 0.75, pump efficiency = 0.3 and Mismatch factor = 0.85 14

3. Classify various Biogas plants and explain the working of Movable drum type plant with a neat sketch. 14

4. Explain in brief the working of : 7+7=14
 - (a) Molten Carbonate Fuel Cells (MCFC)
 - (b) Solid Oxide Fuel Cells (SOFC)

5. Enlist the limitations of OTEC power plant and explain the working of Anderson cycle system. 14

6. A propeller type, horizontal shaft wind turbine has the following wind characteristics : 14

Speed of wind 10m/s at 1 atm and 15°C. The turbine has diameter of 120 m and its operating speed is 40 rpm at maximum efficiency. Calculate :

 - (a) Total power density
 - (b) Total power produced
 - (c) Torque and axial thrust

7. Explain the working principle of management for meeting the energy demand. 14