# P P SAVANI UNIVERSITY

Seventh Semester of B. Tech. Examination

December 2021

SEME4021- Renewable energy Sources and Systems

01.12.2021, Wednesday Time: 09:00 a.m. To 12:30 p.m. Maximum Marks: 60

*Instructions:*

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

## SECTION – I

| | | |
|---|---|---|
| Q - 1 | Answer the Following Any five | [05] |
| (i) | Declination angle | |
| (ii) | Latitude angle | |
| (iii) | Zenith and Nadir | |
| (iv) | Solar azimuth and Surface azimuth angle | |
| (v) | Solar Altitude angle | |
| (vi) | Hour Angle | |
| (vii) | Declination angle | |
| Q - 2 (a) | Write a short note on compound parabolic concentrator. | [05] |
| Q - 2 (b) | Explain sunshine recorder with neat sketch | [05] |
| | **OR** | |
| Q - 2 (a) | Explain | [05] |
| Q - 2 (b) | Explain solar pond. | [05] |
| Q - 3 (a) | Determine LST, Declination, Day length, Sun Rise and Sun set Hour angle at Bhopal (Latitude $23^0$ 15', Longitude $77^0$ 30' E) at 12:30 IST on 8th,August. Take equation of time correction E = - 5:40 (min: sec). | [05] |
| Q - 3 (b) | Enlist various types of solar building applications and explain anyone. | [05] |
| | **OR** | |
| Q - 3 (a) | Calculate number of day length at Delhi on Dec 21st and June 21st in year 2012.take latitude = $28^0$ 35' N | [05] |
| Q - 3 (b) | Explain construction and working of Pyranometer with schematic diagram. | [05] |
| Q - 4 | | [05] |
| (i) | A researcher wants to calculate incidence angle for surface tilted at 30o with horizontal from the data available for horizontal surface:- Angle of incidence for horizontal surface : 45.6°, Surface facing 10° East of South at location, Date : 23rd December (Non leap year), Standard time of location: 12 p.m. Day length for horizontal surface: 10.7 hrs. | |
| (ii) | Calculate LST and declination at Bhopal (Latitude 23° 15' N, longitude 77° 30' E) at 12:30 IST on Aug. 8. Also calculate sunrise, sunset hour angle and day length. | |

## SECTION – II

| | | |
|---|---|---|
| Q - 1 | Answer the Following: | [05] |

| | | |
|---|---|---|
| I | Define : Power Coefficient | |
| II | Why Yaw control is required in wind turbine? | |
| III | Define: Solidity ($\sigma$). What does it represent? | |
| IV | What is lambert's law? | |
| V | Which thermochemical conversion process is used to generate producer gas? | |
| VI | Value of Bets limit is _____. | |
| Q - 2 (a) | Describe the closed cycle OTEC power plant and state its advantages over open cycle system. | [05] |
| Q - 2 (b) | Prove that in case of Horizontal Axis wind turbine maximum power can be developed when exit velocity is 1/3 of the wind velocity and $P_{max} = 8\rho AV_i^3/27$. | [05] |
| | OR | |
| Q - 2 (a) | Explain with neat sketch vapour dominated geothermal power plant. | [05] |
| Q - 2 (b) | How biogas plants classified? Explain continuous and batch type plants. | [05] |
| Q - 3 (a) | List the geothermal resources. List the advantages and disadvantages of geothermal energy. | [05] |
| Q - 3 (b) | Explain basic components of a wind energy conversion system with block diagram. | [05] |
| | OR | |
| Q - 3 (a) | Explain with neat sketch fluidized bed type gasifier. What is its advantage? | [05] |
| Q - 3 (b) | Explain with neat sketch single basin double cycle tidal power plant. | [05] |
| Q - 4 | Attempt any one. | [05] |
| (i) | Explain the process of production of biogas from biomass with block diagram. | |
| (ii) | Write short note on: (i) Savonious rotor and (ii) Darrius rotor. | |

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