

315337

12526

3 Hours / 70 Marks

Seat No.

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- Instructions* – (1) All Questions are *Compulsory*.
- (2) Answer each next main Question on a new page.
- (3) Illustrate your answer with neat sketches wherever necessary.
- (4) Figures to the right indicate full marks.
- (5) Assume suitable data, if necessary.
- (6) Use of Non-programmable Electronic Pocket Calculator is permissible.
- (7) Mobile Phone, Pager and any other Electronic Communication devices are not permissible in Examination Hall.

Marks

1. **Attempt any FIVE of the following:** **10**
- a) Define following terms :–
- i) direct radiation
- ii) diffused radiation.
- b) State any four instruments used to measure solar radiation.
- c) Give name of any two materials commonly used in the fabrication of solar cell.
- d) Define polarization in fuel cell. State any two types of it.
- e) State any four generation used in wind power generation.
- f) Define following terms related to wind power :–
- i) Cut-in wind speed
- ii) Betz limit.
- g) State the various models of biogas plant.

P.T.O.

- 2. Attempt any THREE of the following: 12**
- a) State different types of pyrhelimeter used to measure solar radiation. Explain angstorm compensation pyrhelimeter with neat sketch.
 - b) Explain solar cell with its equivalent circuit diagram and draw its current Vs voltage (I-V) characteristics.
 - c) Explain any four site selection criteria for wind energy conversion sysem (WCES).
 - d) Derive the expression for power developed due to wind.
- 3. Attempt any THREE of the following: 12**
- a) Explain the concept of basic Photovoltaic system for power generation with a neat block diagram.
 - b) State different methods used for hydrogen storage. Explain storage as metal by drides.
 - c) State four advantages and limitations of small scale hydroelectric power generation.
 - d) Explain closed cycle OTEC (ocean thermal electric conversion) system with neat sketch.
- 4. Attempt any THREE of the following: 12**
- a) Explain working principle of binary - cycle geothermal power plant. This type of power plant is preferred for low to moderate temperature geothermal resources. Justify given statement within 2 or 3 sentences.
 - b) Explain the working principle of small hydroelectric power plant for a site with head $\leq 10\text{m}$ and moderate flow recommend a suitable turbine.
 - c) Explain the resistance polarization in fuel cell.
 - d) Describe the construction and working of KVIC digester with neat labelled diagram.
 - e) State the factor to be considered while selecting the site for a biogas plant.

- 5. Attempt any TWO of the following: 12**
- Explain the concept of variable speed and constant frequency scheme in wind energy conversion with neat block diagram.
 - Explain preventive measures to be followed in hydrogen utilization.
 - Explain the concept of Chinese digester and state its two applications.
- 6. Attempt any TWO of the following: 12**
- At a site of latitude $\phi = 19^{\circ}0' N$, On October 15 at 10:30 AM solar time, a flat collector is tilted at an angle equal to the latitude (tilt $\beta = 19^{\circ}$) and faces due south (collector azimuth $\gamma = 0^{\circ}$) then calculate :-
 - Solar declination δ
 - Solar zenith angle θ_2 .
 - The angle of incidence θ between the beam radiation and the normal to the tilted collector.
 - Compare focusing and non-focusing concentrating collectors on any five point. Recommend which one is more suitable for industrial process heating with justification.
 - Compare horizontal axis wind turbine and vertical axis wind turbine on any five points. Recommend which is more suitable for rooftop installation with justification.
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