315337

12526

3 Hours / 70 Marks Seat No. | | | | | | | | |

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.

Marks

2. Attempt any THREE of the following: **12**

a) State different types of pyrheliometer used to measure solar radiation. Explain angstorm compensation pyrheliometer 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 $\leqslant$10m 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.

Marks

5. Attempt any TWO of the following: **12**

a) Explain the concept of variable speed and constant frequency scheme in wind energy conversion with neat block diagram.

b) Explain preventive measures to be followed in hydrogen utilization.

c) Explain the concept of Chinese digester and state its two applications.

6. Attempt any TWO of the following: **12**

a) At a site of latitude ϕ = 19°O' N, On October 15 at 10:30 AM solar time, a flat collector is tilted at an angle equal to the latitude (tilt β = 19°) and faces due south (collector azimuth γ = 0°) then calculate :–

i) Solar declination δ

ii) Solar zenith angle θ_2.

iii) The angle of incidence θ between the beam radiation and the normal to the tilted collector.

b) Compare focusing and non-focusing concentrating collectors on any five point. Recommend which one is more suitable for industrial process heating with justification.

c) Compare horizontal axis wind turbine and vertical axis wind turbine on any five points. Recommend which is more suitable for rooftop installation with justification.