SAMPLE PAPERS

DIPLOMA FIFTH SEMESTER EXAMINATION 2025 (JUT)

RENEWABLE ENERGY TECHNOLOGY

DIPLOMA WALLAH

CLICK HERE TO VISIT DIPLOMA WALLAH WEBSITE

Full Marks: 70 marks | Time: 3 Hours

Instructions:

- Question No. 1 is compulsory.
- Answer any **FOUR** questions from the remaining (Q.2 to Q. 7 marks).

Q.1 Multiple Choice Questions (Compulsory) [2 × 7 = 14]

(i) Solar cells are made of:

(a) Conductor

(b) Insulator

(c) Semiconductor

(d) Superconductor

(ii) The local solar time depends on:

(a) Latitude

(b) Longitude

(c) Altitude

(d) None of the above

(iii) The rotor blades of a wind turbine convert wind energy into:

(a) Electrical Energy

(b) Mechanical Energy

(c) Heat Energy

(d) Chemical Energy

(iv) Which fuel cell is most suitable for electric vehicles?

(a) Molten Carbonate (MCFC)

(b) Proton Exchange Membrane (PEMFC)

(c) Solid Oxide (SOFC)

(d) Phosphoric Acid (PAFC)

(v) Gasification of biomass produces a gas mixture called:

(a) Biogas

(b) Producer Gas / Syngas

(c) Natural Gas

(d) LPG

(vi) Which of the following is a disadvantage of Tidal Energy?

(a) Pollution free

(b) Renewable

(c) Intermittent (only during tides)

(d) High efficiency

(vii) In a PV system, the function of a 'Charge Controller' is:

(a) To convert DC to AC

(b) To protect the battery from overcharging

(c) To track the sun

(d) To increase voltage

Q.2

(a) Explain the difference between Focusing Type and Non-Focusing Type solar collectors with examples. [7 Marks]

(b) Define Declination Angle, Hour Angle, and Zenith Angle in solar geometry. [7 Marks]

Q.3

(a) Explain the Variable Speed and Constant Frequency scheme in wind power generation. Why is it used? [7 Marks]

(b) List the important considerations for Site Selection for a Wind Power Plant. [7 Marks]

Q.4

(a) Compare Hydrogen with other conventional fuels. What are the advantages and disadvantages of using Hydrogen as a fuel? [7 Marks]

(b) Explain the methods of Hydrogen Storage (Gas, Liquid, and Solid state). [7 Marks]

Q.5

(a) Explain the process of Anaerobic Digestion in detail. What are the different stages involved? [7 Marks]

(b) Draw a neat diagram of a Pragati Biogas Plant and explain its working briefly. [7 Marks]

Q.6

(a) Explain the working principle of Ocean Thermal Energy Conversion (OTEC) using a Closed Cycle (Anderson Cycle) or Open Cycle diagram. [7 Marks]

(b) List the major components of a Small Hydroelectric Power Plant (SHP) and explain the function of the Penstock and Turbine. [7 Marks]

Q.7 Write Short Notes on (Any FOUR): [3.5 × 4 = 14]

(a) Solar Azimuth Angle

(b) DFIG (Doubly Fed Induction Generator)

(c) Pyrolysis

(d) Wet vs Dry type Geothermal Plants

(e) Betz Limit

SOLUTIONS FOR PAPER - 3

MCQ Answers:

(i) c, (ii) b, (iii) b, (iv) b, (v) b, (vi) c, (vii) b

Brief Hints for Theory:

- **Q2(a): Focusing:** Concentrates light (e.g., Parabolic trough), high temp. **Non-focusing:** Absorbs as is (e.g., Flat plate), low temp.
- **Q3(b):** High wind speed, open terrain, near transmission lines, soil strength, away from migratory bird paths.
- **Q4(b):** Compressed Gas (Cylinders), Liquid H_2 (Cryogenic tanks, very cold), Metal Hydrides (Absorbed in metal lattice).
- **Q5(a):** Stages: Hydrolysis -->Acidogenesis -->Acetogenesis -->Methanogenesis.
- **Q6(a):** OTEC uses temp difference between warm surface water and cold deep water to vaporize a fluid (Ammonia) to turn a turbine.