

Subject: Physics
Paper Code: BPH-S501
Paper Name: Renewable Energy and Energy Harvesting

Time: 3 hours

Max. Marks: 70

Note: Question paper is divided into two sections A & B. Attempt all sections as per instructions.

SECTION – A
(Short Answer Type Questions)

Note: Answer any **five** questions in about 150 words each. Each question carries **six** marks.

1. What are the non-renewable sources of energy? Explain the advantages and disadvantages of it.
2. Describe the principle of working of a H_2O_2 fuel cell. Also derive the Gibbs-Helmholtz equation for computing the enthalpy of reaction
3. Explain the thermoelectrical and thermionic principle. Describe the devices used for electrical generation.
4. Give a scheme of a closed loop MHD generation with details of operational problems.
5. What is a solar pond? Diagrammatically explain about the different zones in it.
6. Find the average power developed in a tidal plant of basin area 1 km^2 and range of tide is 7.8 m, in single as well as in double effect scheme, if the tide cycle is 6 h 12.5 min and find the actual energy available from turbine.
7. What are the merits and demerits of the hydro-electric power stations?
8. What are the prospects of geothermal field in India? Discuss the nature and characteristics of Indian geothermal reservoirs and its possible utilisation.
9. State the present status of tidal power plants in India. Why is the tidal energy not being utilized?
10. Why is there piezoelectricity in a material? Explain about the piezoelectric energy harvesting solutions.

SECTION – B
(Long Answer Type Questions)

Note: Answer any **four** questions in detail. Each question carries **ten** marks.

1. Discuss the following terms:
 - (a) Angle of latitude
 - (b) Solar Azimuth angle
 - (c) Solar constant
 - (d) Surface Azimuth angle
 - (e) Zenith angle

2. Discuss the future prospective of solar energy use in India. Draw and explain characteristics of a typical solar cell.
3. Discuss the process of biogas generation. List the factors affecting the generation of biogas and explain them.
4. What do you understand by the nature of wind? Describe with the help of a diagram about the construction and working of a Wind Energy Conversion System (WECS).
5. What is the importance of hydro-power plants in India? Describe how electric energy is generated in such plants.
6. With suitable diagram, explain OTEC system for ocean thermal energy. Discuss the advantages and limitations of OTEC.
7. What is the real definition of energy harvesting? What can we do today with energy harvesting? What can we expect energy harvesting to look like in the next five years?
8. Discuss carbon captured technologies in detail with suitable examples.