

- N.B. :** (1) Question No. 1 is **compulsory**.
(2) Attempt any **four** questions from remaining **six** questions.
(3) Assumptions made (if any) should be **properly justified**.
(4) Use illustrative **diagrams** wherever **possible**.
1. (a) List different methods of directly harnessing solar energy. Compare advantages and disadvantages of concentrating collectors over flat plate collectors. 10
(b) Explain the existing and predicted trend of energy demand in India. What are the limitations each of the used of conventional and non-conventional sources of energy ? 10
 2. (a) Estimate the average daily global radiation on a horizontal surface in Srinagar ($34^{\circ} 06'N$) if average sunshine hours is 9.5, $a = 0.35$, $b = 0.4$ and March, 16th is typical day for that month. 10
(b) Derive a relation for transmittance coefficient for series of glass covers in flat plate collector. 10
 3. Write short notes on any **four** of the following :— 20
 - (a) Physics of solar photo voltaics
 - (b) Critical criteria in design of OTEC plants
 - (c) Site selection and tidal power plants
 - (d) Power generation using salt stratified solar pond
 - (e) Uses of geothermal energy
 - (f) Principles of power generation using wave energy.
 4. (a) Define and explain the following :— 10
 - (i) Latitude
 - (ii) Declination
 - (iii) Surface azimuth angle
 - (iv) Hour angle
 - (v) Day length.
(b) Explain with sketches applications of biogas. 10
 5. (a) Explain with neat sketch, wind energy conversion systems. Classify wind mills. 10
(b) Explain solar radiation measurements devices in detail. 10
 6. (a) Describe basic principle of fuel cell. Compare advantages and disadvantages of different types of fuel cells and classify them. 10
(b) Explain what is power coefficient tip speed ratio and solidity of a WECS and sketch the relationship between these parameters. 10
 7. Write short notes on the following :— 20
 - (a) Gobar Gas Plant
 - (b) Site Selection of Wind Power Plants
 - (c) Solar Pond
 - (d) Wood Pyrolysis.