

(3 Hours)

(Maximum marks: 80)

Note:

1. Question No.1 is compulsory.
2. Attempt any three questions from remaining.
3. Assume suitable data if required.

Q.1 Solve any Five

(20)

- a) Estimate the available energy sources in Maharashtra?
- b) State the advantages of renewable energy sources with special reference to Indian context.?
- c) What are the methods for obtaining energy from Biomass.
- d) Define Slope, Zenith angle, Surface azimuth angle, air mass.
- e) What is geothermal Energy? State its limitations.
- f) What factors are taken into consideration in site selection of wind generators?

Q.2 a) What is Betz coefficient? Show that the ideal maximum theoretical efficiency is 59% for a horizontal axis wind mill. **(8)**

b) Describe construction and working distributed heliostat point focusing reflector **(6)**

c) What are the applications of geothermal energy at different temperatures? **(6)**

Q.3 a) Determine the average value of solar radiation on a horizontal surface for June 22, at the latitude of $10^{\circ}N$, if constants a and b are given as equal to 0.30 and 0.51 respectively and ratio $\frac{n}{N} = 0.55$. **(8)**

b) Describe construction and working of KVIC digester. **(6)**

c) Describe construction and working of single basin tidal power plant? **(6)**

Q.4 a) Describe working of Darrieus type machines with the help of neat sketch and its characteristics. **(8)**

b) What are the advantages and limitations of wave energy conversion? **(6)**

c) Describe the applications of solar ponds? **(6)**

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- Q.5 a) The following data are given for a family biogas digester suitable for the output of five cows: the retention time is 20 days, temperature 30°C, dry matter consumed per day = 2 kg, biogas yield is 0.24 m³ per kg. The efficiency of burner is 60%, methane proportion is 0.8. Heat of combustion of methane = 28 MJ/m³. Calculate volume of biogas digester and power available from the digester. **(10)**
- b) Describe working of basic OTEC system with the help of neat sketch. **(6)**
- c) What is function of pyranometer and pyrliometer? **(4)**
- Q.6 a) Wind at 1 standard atmospheric pressure and 15°C has velocity of 15 m/s, turbine diameter = 120m, turbine operating speed = 40 rpm at maximum efficiency. Calculate total power density in the wind stream, maximum obtainable power density, reasonably obtainable power density, total power, torque and axial thrust. **(10)**
- b) Describe working and applications of concentrated photo voltaic solar cell. **(6)**
- c) Describe working of liquid dominated double flash steam system. **(4)**
