Q. P. Code : 50644

**(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 $10^0$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)**

Q.5  a)  The following data are given for a family biogas digester suitable for the output of **(10)** five cows: the retention time is 20 days, temperature $30^0C$, dry matter consumed per day = 2 kg, biogas yield is 0.24 $m^3$ per kg. The efficiency of burner is 60%, methane proportion is 0.8. Heat of combustion of methane = 28 $MJ/m^3$. Calculate volume of biogas digester and power available from the digester.

b)  Describe working of basic OTEC system with the help of neat sketch.  **(6)**

c)  What is function of pyranometer and pyrheliometer?  **(4)**

Q.6  a)  Wind at 1 standard atmospheric pressure and $15^0C$ has velocity of 15 m/s, turbine **(10)** 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.

b)  Describe working and applications of concentrated photo voltaic solar cell.  **(6)**

c)  Describe working of liquid dominated double flash steam system.  **(4)**

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