MEPE–301(C)

M. E./M. Tech. (Third Semester)
EXAMINATION, Dec., 2011
(Grading/Non-Grading System)

NON-CONVENTIONAL ENERGY SOURCES AND ENERGY CONVERTERS

[MEPE–301(C)]

Time : Three Hours

Maximum Marks : { *GS : 70* / *NGS : 100* }

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) What are primary and secondary energy sources ? Give the conclusions on alternate energy strategies.

   (b) What is meant by renewable energy sources ? Explain in brief these energy sources with special reference to Indian context.

2. (a) Wind at 1 standard atmospheric pressure and 15°C temperature has velocity of 10 m/s. The turbine has diameter of 120 m and its operating speed in 40 r.p.m. at maximum efficiency. Calculate :

   (i) the total power density in the wind stream.

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(ii) the maximum obtainable power density assuming $\eta = 40\%$.

(iii) the total power produced (in kW).

(iv) the torque and axial thrust.

(b) What is meant by 'energy plantation' ? What are its advantages and disadvantages ?

3. (a) Determine the average value of solar radiation on a horizontal surface for June, 22 at the latitude of 10°N, if constants a and b are given as equal to 0·30 and 0·51 respectively and the ratio $\frac{n}{N} = 0{\cdot}55$.

(b) What is principle of collection of solar energy used in a non-convective solar pond ? Describe a non-convective solar pond for solar energy collection and storage.

4. (a) Discuss different energy management techniques used in practise.

(b) Write shortly and briefly, methods of energy audit measurement systems.

5 (a) What are the different type of energy converters ? Discuss briefly and also give comment for futuristic system in this area.

(b) Describe in detail mini-hydro generators.

6. (a) What is a community biogas plant ? What are the main problems encountered in its operation ? What are the techniques suggested for maintaining the biogas production ?

(b) The following data are given for a family biogas digester suitable for the output of five cows :

The retention time is 20 days the temperature 30°C, 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.

7. (a) With the help of a neat sketch describe a solar heating system using air heating solar collectors, with advantages and disadvantages of the system.

(b) Describe briefly the different methods of producing hydrogen from solar energy.

8. Write short notes on the following

(a) Wind-hydro biomass system

(b) PV operated motor and pumps system

(c) Solar-wind system with storage battery

(d) Biomass conversion