Total No. of printed pages = 2

ME 181 OE 12

Roll No. of candidate

28/2/22 2021

B.E. 7th Semester End-Term Examination

RENEWABLE ENERGY SOURCES

New Regulation (w.e.f. 2017-18) and New Syllabus (w.e.f. 2018-19)

Full Marks – 70   Time – Three hours

The figures in the margin indicate full marks
for the questions.

Answer any *five* questions.

1. (a) What are primary and secondary energy sources?   (4)

   (b) Which type of non-conventional energy source is the best suitable for rural and agricultural applications and why? Explain in detail   (10)

2. (a) What is meant by anaerobic digestion? What are the factors, which affect biodigestion? Explain briefly.   (2+8=10)

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

   Retention time = 20 days

   Temperature = 30°C

   Dry matter consumed = 2 kg/day

   Biogas yield = 0.24 m^3/kg

   Burner efficiency = 60%

   Methane proportion = 0.8

   Heat of combustion of methane = 28MJ/m^3 at STP

   Calculate :
   (i) Volume of the biogas digester

   (ii) Power available from the digester   (2+2=4)

[Turn over

3. (a) Explain flat plate and concentrating solar energy collectors. What is tracking of the concentrator? (6)

(b) Discuss, with a neat sketch, the central tower concept of utilizing solar energy in Rankine cycle operation for electricity generation. (8)

4. (a) Discuss the advantages and disadvantages of horizontal and vertical axis windmill. (8)

(b) Calculate the rotor radius and rotor speed for multi-blade wind machine operating at a design speed of 25 kmph. The machine operates a water pump having capacity of $5.1 m^3/hr$ and lift of 9 m. Following data are given:

Density of water = $996 kg/m^3$

Efficiency of water Pump = 0.6

Efficiency of transmission from rotor to pump = 0.9

Power Coefficient (Cp) = 0.31

Tip speed ratio (λ) = 0.75

Density of air= $1.2 kg/m^3$ (6)

5. (a) What are the main types of OTEC power plants? Describe their working in brief with neat sketches. (8)

(b) Describe the advantages of 'closed cycle' OTEC system, over its 'open cycle' system. (6)

6. (a) What is meant by 'uranium enrichment'? Why is it required? Describe some methods of uranium enrichment in brief. (8)

(b) What are the essential requirements of nuclear fusion? (6)

7. Describe the principle of working and constructional details of a basic thermionic generator with a neat diagram. (14)

8. Write short notes on the following (any two): ($2 \times 7 = 14$)

(a) Fuel cells

(b) Pyranometer

(c) Classification of biogas plants

(d) Thermal energy storage

(e) Hot springs