Total No. of printed pages = 3

ME 181OE12

05/01/2023

Roll No. of candidate

2022

B.Tech. 7th Semester End-Term Examination

ME

RENEWABLE ENERGY SOURCES

New Reg (w.e.f 2017 – 18) & 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 question No. 1 and any *FOUR* from the rest.

1. Answer the following questions : (10)

   (i) The value of solar constant is

       (a) 1347 W/m²   (b) 1357 W/m²

       (c) 1367 W/m²   (d) 1377 W/m²

   (ii) Which of the following is the indirect method of solar energy utililzation?

       (a) Wind energy   (b) Biomass energy

       (c) Wave energy   (d) All of the above

   (iii) The wind speed suitable for wind energy generation is

       (a) 0-5 m/s   (b) 5-25 m/s

       (c) 25-50 m/s   (d) 50-75 m/s

[Turn over

(iv) Which of the following constituents is maximum in biogas?

    (a) H_2 (b) CO_2

    (c) CO   (d) CH_4

(v) The numerical value of surface azimuth angle is-

    (a) $0\text{-}90°$ (b) $-90\text{-}90°$

    (c) $0\text{-}180°$ (d) $-180\text{-}180°$

(vi) Beam radiations are measured with

    (a) Anemometer   (b) Pyrheliometer

    (c) Sunshine recorder   (d) All of the above

(vii) In a wind turbine, if the velocity of wind is doubted, within the operating range, the power output will be

    (a) Six times   (b) Eight times

    (c) Doubled   (d) Reduced to half

(viii) Compared to conventional steam plant, the temperature and pressure in a geothermal plant are

    (a) Comparable   (b) Much higher

    (c) Much Lower   (d) None of the above

2. What is meant by renewable energy sources? Discuss about their availability, relative merits and classification.   (3+12=15)

3. (a) Define the following term: (3+3=6)

    (i) Solar Irradiance

    (ii) Solar Constant

(b) What is a Solar Still? Explain its working with a neat sketch. Differentiate between beam and diffused radiation.   (2+5+2=9)

4. (a) Derive the expression for maximum power extracted from wind by a wind turbine.   (10)

(b) Wind at 1 bar pressure and 20° C has a velocity of 12 m/s, turbine diameter=60m and turbine operating speed=50rpm at maximum efficiency. Calculate the following:

    (i) Maximum obtainable power density

    (ii) Torque at a maximum efficiency   (5)

5. (a) Explain in brief various biomass energy conversion technologies. (7)

(b) Compare the performance of floating drum and fixed dome type biogas plants with their respective neat sketch. (8)

6. What are the different types of cycle based OTEC power plants? Describe their working in brief with neat sketch along with their advantages and limitations. (4+11=15)

7. (a) What is Geothermal Energy? Discuss the various methods harnessing this energy with the help of neat sketch. 3+10=13

(b) What do you mean by fuel cell? (2)