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23/2/22 2021

B.Tech 7th Semester End Term Examination

EE

RENEWABLE ENERGY SOURCES

(New Regulation w.e.f 2017-18) &

(New Syllabus w.e.f 2018-19)

ull Marks – 70 Time – Three hours

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

N.B:

1. Attempt all questions.
2. Assume suitable data where required.
3. Justify your answer with diagram, graphs.

1. Answer any *five* of the following: $(5 \times 5 = 25)$

(a) What are the different renewable energy sources? Explain the various renewable energy sources in India.

(b) What are the different reasons for depletion of solar radiation?

(c) What are the different parameters that effect on performance of a solar collector?

(d) Explain the following:

(i) Solar time

(ii) Declination

(iii) Solar day length

(e) What is solar constant? Explain the I-V characteristics of a practical solar cell.

(f) What is the function of blocking diode and bypass diode in solar panel? Explain.

(g) What is fuel cell? Compare a fuel cell and a battery.

[Turn over

2 Attempt any *five* of the following: (5 × 5 = 25)

(a) With a neat diagram explain a solar water heating system.

(b) Derive the expression for maximum axial thrust experienced by a wind turbine and also find the condition for such operation.

(c) What is Biomass? Explain any one type of biomass gasifier.

(d) Explain the technologies available of ocean thermal energy conversion.

(e) What are spring tides and neap tides? Explain origin of tides in the sea.

(f) Write potential of geothermal energy in India.

(g) Write short notes on any *one* of the following.

(i) Solar still

(ii) Application of solar PV systems

(iii) Geothermal Energy

3. Attempt any *four* of the following: (4 × 5 = 20)

(a) Calculate the number of daylight hours (day length) at Guwahati on 21 June and 21 December in a leap year. the latitude of Guwahati is 26.14^0 N.

(b) A solar cell has following parameters:

Open circuited voltage =0.55 volts

Short circuited current =25 milliamps/cm^2

Fill factor = 0.75

Find the efficiency of the solar cell

(c) The band gap for GaAs is 1.43 eV. Calculate the optimum wavelength of light for photovoltagic generation in GaAs cell.

(d) What is the swept area of a wind turbine with 6 blades each of 2m long? If the wind is blowing at 12 m/s. Find the power that turbine gets.

(e) A deep ocean wave of 2.5 m peak to peak appears at a period of 10s. Find the wavelength, phase velocity and power associated with the wave. At this power rate, what is the average annual wave energy in MWh/m?

(f) A tidal power plant of the simple single basin type has a basin area of $30 \times 10^6 \, m^2$. The tide has a range of 12 m. The turbine, however, stops operating when the head on it falls below 3 m. Calculate the energy generated in one filling (or empting) process, in kWh if the turbinetidal generation efficiency is 73%.
