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B. M. S. College of Engineering, Bengaluru - 560019

Autonomous Institute Affiliated to VTU

September / October 2023 Supplementary Examinations

Programme: B.E. **Semester: V**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 20ME5DERES **Max Marks: 100**
Course: Renewable Energy Sources **Date: 13.09.2023**

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

UNIT - I

1.	a)	What do you understand by energy conservation? Explain its various aspects.		**06**
	b)	Explain the principle of waste heat utilization and its various applications.		**06**
	c)	Why is a binary cycle plant more efficient than open cycle plant? Comment on the amount of energy saved by using a gas-steam binary cycle plant.		**08**

UNIT - II

2.	a)	What are the major advantages and disadvantages of a solar PV systems?		**06**
	b)	What is the importance of maximum power point tracker (MPPT) in an SPV system? Explain various strategies used for operation of an MPPT.		**06**
	c)	With the help of block diagram, explain the operation of grid interactive solar PV systems.		**08**

UNIT - III

3.	a)	Discuss any 4 factors which are affecting the distribution of wind energy on the surface of the earth.		**04**
	b)	Derive an expression for Torque developed by a wind turbine.		**08**
	c)	Sketch the diagram of vertical axis wind turbine and explain the functions of its main components.		**08**

OR

4.	a)	With the help of a diagram, explain the nature of variation of wind speed with reference to the height from the ground level.		**06**

b) A Horizontal Axis Wind Turbine (HAWT) is installed at a location with free wind velocity of 20 m/s. The rotor diameter is 30 m. determine the speed to be maintained to produce the maximum output. **06**

c) With the help of block diagram, explain the functions of various components used for wind energy conversion systems. **08**

UNIT - IV

5. a) What are the main advantages in the usage of biogas? Explain its constituents and heating value parameter. **05**

b) Discuss the different resources of biomass energy and the energy yield from each of them. **05**

c) Explain the various factors affecting the performance of biogas digester. **10**

OR

6. a) Name the various models of biogas plant. Explain the working of a fixed-dome type biogas plant with a neat sketch. **06**

b) Calculate the volume of fixed-dome type biogas digester for the output of two cows. Also, calculate the thermal power available from biogas. Use the following data: **06**

Retention time = 40 days

Dry matter produced 2 kg/day/cow

Biogas yield = 0.22 m^3/kg of dry matter

Percentage of dry matter in cow dung = 18%

Density of slurry = 1090 kg/m^3

Burner efficiency = 60%

Heating value of biogas = 23 MJ/m^3

c) Write a short note on, i) Updraft type, and ii) Downdraft type gasification plants. **08**

UNIT - V

7. a) What is fuel cell? Describe the principle of working of solid oxide fuel cell with relevant reactions. **06**

b) Draw the conceptual block diagram of a fuel-cell power plant and explain the details of each block. **06**

c) Write a short note on, i) Environmental effects of fuel-cell, and ii) Applications of fuel-cell **08**

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