U.S.N.										

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

Autonomous Institute Affiliated to VTU

February / March 2023 Semester End Main Examinations

Programme: B.E. **Semester: V**
Branch: Mechanical Engineering **Duration: 3 hrs.**
Course Code: 20ME5DERES **Max Marks: 100**
Course: Renewable Energy Sources **Date: 09.03.2023**

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

Important Note: Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.

UNIT - I

1	a)	List any 3 non-conventional energy sources and write their advantages and disadvantages.	**05**
	b)	Discuss Kyoto protocol.	**06**
	c)	Discuss (CDM) Clean Development Mechanism and its steps.	**09**

UNIT - II

2	a)	Classify different types of solar PV cells based on materials.	**04**
	b)	With a neat sketch explain grid interactive solar PV system.	**08**
	c)	Explain in brief, any four solar thermal systems.	**08**

UNIT - III

3	a)	Derive an expression for maximum efficiency that can be obtained from wind mill.	**10**
	b)	List and brief about factors to be considered for site selection for wind mill.	**10**

OR

4	a)	A 10 m/s wind is at atmospheric pressure and 15℃ temperature. Calculate i) total power density in the wind stream ii) maximum power density obtainable, iii) reasonably obtainable power density in $W/m^{2,}$, iv) total power produced if the turbine diameter is 120 m, and v) torque and axial thrust if the turbine operating at 40 RPM and max efficiency.	**10**
	b)	With neat sketch explain the working of single blade horizontal wind mill.	**10**

UNIT - IV

5	a)	List the advantages of anaerobic process.	**10**
	b)	Explain in detail the factors affecting the bio digestion process.	**10**

OR

6 a) The following data are given for a family biogas digester suitable for output of 5 cows, the retention time is 20 days, the temperature is 30° C, dry matter consumed per day is 2 kg, biogas yield is 0.24 m^3 per kg. The efficiency of the burner is 60 % methane proportion is 0.8, heat of combustion of methane is 28 MJ/m^3. Assuming the standard data for designing, calculate i) the volume of digester ii) the power available from the digester. **10**

b) Explain the production of ethanol from sugarcane with relevant chemical reaction equations. **10**

UNIT - V

7 a) What is fuel cell? Describe the principle of working of Phosphoric Acid Fuel Cell (PAFC). **08**

b) Explain Solid Oxide Fuel Cell (SOFC). **06**

c) Describe briefly the application and environmental effects of fuel cells. **06**

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