U.S.N.										

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

Autonomous Institute Affiliated to VTU

April 2024 Semester End Make-Up Examinations

Programme: B.E. **Semester: VII**
Branch: Institutional Elective **Duration: 3 hrs.**
Course Code: 19CH7OEAET **Max Marks: 100**
Course: Advances in Energy Technology

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

			CO	PO	Marks
		UNIT - I			
1	a)	Define energy resources and classify them into distinct categories based on their long-term availability.	*CO1*	*PO2*	**06**
	b)	Discuss India's current production and reserves of major fossil fuels such as coal, petroleum and natural gases.	*CO2*	*PO7*	**08**
	c)	Evaluate the need for alternative energy resources in the context of increasing energy demand.	*CO1*	*PO2*	**06**
		UNIT - II			
2	a)	Determine the solar insolation on 2nd March by assuming the solar constant G_{SC} = 1377 W/m^2.	*CO3*	*PO2*	**05**
	b)	Discuss the various components and working principle of flat-plate collector with the aid of labelled diagram.	*CO4*	*PO6*	**08**
	c)	Analyze the advantages and disadvantages of photovoltaic cells as a technology for harnessing solar energy.	*CO4*	*PO6*	**07**
		UNIT - III			
3	a)	Define the process of pyrolysis and discuss the general procedure for the pyrolysis of pretreated biomass along with a flow diagram.	*CO3*	*PO2*	**10**
	b)	Design the biogas plant considering the availability of 5 cows. Consider an availability of 2 kg dry mass per day. Data given for plant: Retention time = 20 days, T = 30 ^{0}C, Biogas yield = 0.24 m^3/kg, Burner efficiency = 60 %, Fraction of CH_4 in biogas = 0.8, Heat of combustion of methane = 28 MJ/m^3 & density of dry matter = 50 kg/m^3. Calculate (i) The volume of biogas plant, and (ii) Power available from the plant.	*CO5*	*PO3*	**10**
		OR			
4	a)	Explain the refuse-derived fuel (RDF) for energy recovery from waste along with a schematic diagram.	*CO6*	*PO2*	**10**

		b)	What are the three different types of geothermal power plants? Explain the working principle of any one geothermal power plant along with diagram.	***CO3***	***PO2***	**10**
			UNIT - IV			
	5	a)	Mathematically prove that power available in the wind energy, which is proportional to cube of wind speed.	***CO3***	***PO2***	**08**
		b)	Determine the diameter of a wind turbine required to produce an output of 6 kW, given a wind speed of 9 m/s and a rotor speed of 120 rpm. Assume power coefficient = 0.4, mechanical transmission efficiency = 0.9, and electrical transmission efficiency = 0.9.	***CO5***	***PO3***	**12**
			OR			
	6	a)	Mathematically prove that the maximum theoretical power extracted by a wind turbine can't be more than 0.59 times the wind power available.	***CO5***	***PO3***	**12**
		b)	Explain the working principle of hydropower plant with a neat labelled diagram.	***CO3***	***PO2***	**08**
			UNIT - V			
	7	a)	Explain the working principle of proton-exchange membrane fuel cell (PEMFC).	***CO3***	***PO2***	**08**
		b)	Classify fuel cell into different types based on their electrolyte, operating temperature, and fuel source.	***CO3***	***PO2***	**07**
		c)	Discuss the various potential applications of fuel cell technology in different sectors.	***CO6***	***PO2***	**05**

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