Name: Enrolment No:	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2019

Programme Name: B. Tech PSE and B. Tech Electrical **Semester : VIII**
Course Name : Renewable Energy Technology & Cogeneration **Time : 03 hrs**
Course Code : PSEG-471 **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: Attempt all questions. Internal choice is given in Q9 and Q11

SECTION A

S. No.	Question Body	Marks	CO
Q1	List down the advantages and disadvantages of concentrating collectors over flat plate collectors.	4	CO1
Q2	Discuss I/V characteristics of solar PV System and list the parameters on which the performance of the solar PV system is dependent.	4	CO2
Q3	Explain and differentiate between Isovents and Isodynes for wind energy assessment.	4	CO3
Q4	Calculate (i) the volume of a biogas digester suitable for the output of four cows, and (ii) the power available from the digester. Retention time is 20 days, temperature 30°C, dry matter consumed 2 kg/day, biogas yield 0.24m^3 per kg. Burner efficiency is 60%, methane proportion is 0.8, Hm the heat of combustion of methane may be assumed to be 28 MJ/m^3 at STP.	4	CO1
Q5	Briefly explain the geothermal field with the help of neat sketch.	4	CO4
	SECTION B		
Q6	Explain the principle of Tidal Power in detail and draw the neat sketch of Tidal Power Plant highlighting its main components.	10	CO1
Q7	With the help of neat layout explain in detail the operation of typical Biomass Incineration plant.	10	CO3
Q8	Describe in detail the layout of Binary fluid geothermal power system.	10	CO4
Q9(a)	Explain in detail the working of OTEC open cycle system.	10	CO2
	OR		
Q9(b)	Explain the principle of CO-Generation and discuss the factors influencing cogeneration choice.	10	CO2
	SECTION-C		
Q10	(a) Explain the chemistry of gasifier and list down various types of gasifiers with their	20	CO3

	advantages and disadvantages (b) Describe the concept of Biomass Pyrolysis and explain the Pyrolysis of urban waste with the help of neat diagram.		**CO4**
Q11(a)	(a) Discuss in detail any two fixed dome type of biogas plant with their pros and cons. (b) A tidal power plant of the simple single basin type, has a basin area of $30*10^6$ m^2. The tide has a range of 12m. The turbine however, stops operating when the head on it falls below 3m. Calculate the energy generated in one filling (or emptying) process, in kilowatt hours if the turbine generator efficiency is 73%.	**10** **10**	**CO2**
	OR		
Q11(b)	(a) Describe any 4 horizontal axis wind turbines with their advantages and disadvantages. (b) Wind at 1 standard atmospheric pressure and 15oC temperature has a velocity of 10m/s. The turbine has diameter of 120 m and its operating speed is 40 rpm at maximum efficiency calculate (i) The total power density in the wind stream (ii) The maximum obtainable power density assuming efficiency of 40%. (iii) The total power produced in kW (iv) The torque and axial thrust.	**10** **10**	**CO2**

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SECTION A

S. No.	Question Body	Marks	CO
Q1	Differentiate between beam and diffused radiation.	4	CO1
Q2	Classify low temperature thermal storage system and list any four advantages of phase change energy storage system.	4	CO2
Q3	Tabulate various biomass conversion technologies indicating the principle products obtained from the conversion.	4	CO3
Q4	Explain the reason for the variation in wind speed with increase in height from the earth surface.	4	CO2
Q5	Explain in brief the equivalent circuit of solar cell.	4	CO1
	SECTION B		
Q6	Explain in detail various wind resource assessment techniques and derive the expression of power available in the wind.	10	CO2
Q7	Explain in detail the working of combined cycle power plant and explain its Temperature and entropy diagram.	10	CO4
Q8	Discuss the methods for maintaining biogas production and with the help of neat diagram explain the biomass gasifier engine system.	10	CO3
Q9(a)	Draw and explain the layout of solar pond electrical power plant and list down the application of solar ponds.	10	CO1
	OR		
Q9(b)	Discuss the concept of Schottky Junction and discuss any two recently discovered PV cell materials with their advantages and disadvantages.	10	CO1
	SECTION-C		
Q10	i. **"CO-Generation results into the increased overall efficiency of the system"** Justify the statement by giving some relevant examples. ii. Discuss the methodology of conducting performance test on CO-Generation	10	CO4

	system and list various factors which can influence the performance of CO-Generation.	**10**	
Q11(a)	i. A feasibility study must be carried for implementing the wind power plant. As an engineer you have been assigned the responsibility to carry out the feasibility study of determining the potential of wind power in the identified area. Discuss the methodology and the data required to determine the wind potential in the identified area. Also list various types of instruments that will be used to conduct this feasibility study.	**10**	**CO1**
	ii. Derive and explain the methodology of determining the Energy potential in Simple single basin tidal system.	**10**	**CO3**
	OR		
Q11(b)	i. Discuss in detail the open and closed cycle OTEC system and discuss their merits and demerits.	**10**	**CO1**
	ii. The observed difference between the high and low water tide is 8.5 m, for a proposed tidal site. The basin area is about 0.5 square kilometer which can generate power for 3 hours in each cycle. The average available head is assumed to be 8 m, and the overall efficiency of the generation to be 70%. Calculate the power in HP at any instant and the yearly power output. Average specific weight of sea water is assumed to be 1025 kg/m^3.	**10**	**CO3**