UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, April/May 2018

Course: Alternate energy Sources
Semester: VIII
Program: B.Tech Mechanical engineering
Time: 03 hrs.   **Max. Marks: 100**

Instructions:

SECTION A

S. No.		Marks	CO
Q	ATTEMPT ALL THE QUESTIONS		
Q1	Comment on the relative features of HAWT and VAWT.	5	CO4
Q2	Enumerate the differences between dry fermentation and wet fermentation.	3	CO3
Q3	Describe the principle of solar photovoltaic energy conversion	3	CO2
Q4	What is the current status of development of biomass energy in India.	3	CO1
Q5	With help of diagram, discuss the power versus wind speed characteristic of a wind turbine.	3	CO2
Q6	How does sun tracking helps in energy collection by a flat plate solar collector?	3	CO3
	SECTION B		
Q	**ATTEMPT ALL THE QUESTIONS**		
Q7	Classify different types of gasifiers? Explain with the help of diagram the working of up draught and Downdraught gasifiers.	10	CO4
Q8	Discuss the current status of geothermal energy in India. Explain various types of geothermal resources and their extraction process.	10	CO1
Q9	Using Betz model of a wind turbine derive the expression for power extracted from the wind .What is the maximum theoretical power that can be extracted and under what condition.	10	CO2
Q10	Compare the relative performance of a floating drum and fixed dome type biogas plants. **Or**	10	CO3,CO5

	Calculate the volume of the fixed dome type biogas digester for the output of the two cows. Also calculate the thermal power available from biogas. Use the following data. Retention time = 40 days, Dry matter produced =2 kg/day.		
	SECTION-C		
Q	Statement of question		**CO5**
Q11	A HAWT is installed at a location having free wind velocity of 15 m/s. the 80 m diameter rotor has three blades attached to hub. Find the rotational speed of the turbine for optimal energy extraction. Or Discuss the aerodynamic analysis of the blades of wind turbine.	**10**	**CO3,CO4**
Q12	Following data were recorded for a two blade HAWT: Average free wind speed at a height of 10 m = 8 m/s α = 0.13 air density = 1.226 kg/m³. hub height from the ground = 80 m Rotor diameter = 60 m Down stream wind velocity is half that of upstream wind. Find (i) Power available in the wind (ii) Power extracted by the turbine (iii) Axial force .	**10**	**CO5**

Q13	Explain the following terms with the help of a diagram.
	    I. Solar constant
	    II. Zenith angle
	    III. Hour angle.
	    IV. Solar altitude angle.
	
	Azimuth angle.
		10	**CO2**

Q14	A PV system feeds a dc motor to produce 1 hp power at the shaft . The motor	**10**	**CO5**

efficiency is 85%.Each module has 36 multi crystalline solar cells arranged in 9X4 matrix .The cell size is 125 mm X 125mm and cell efficiency is 12%.Calculate the number of modules required in the PV array. Assume global incident radiations to be 1 KW /m ².

OR

Calculate the angle of incidence on a horizontal plane surface ta Kolkata, at 14:00 hrs (IST) , on march 21 , in a leap year. The longitude and latitude of Kolkata are 88° 44' E and 22° 32' N respectively. The standard longitude of IST is 81° 44' E.