


Name:		 <b>UPES</b> UNIVERSITY WITH A PURPOSE
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**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**  
**Online end Semester Examination, June 2021**

**Course: Renewable energy Technologies**

**Semester: I**

**Program: M.Tech– Energy systems**

**Duration: 3 hrs.**

**Course Code: EPEC7030**

**Max. Marks: 100**

**No. of Pages: 02**

**Note:**

**Section A (Attempt the following)**

Q1.	Calculate fill factor, maximum power and cell efficiency of the solar cell at an intensity of 200 W/m <sup>2</sup> . V <sub>oc</sub> = 0.24 Volt, I <sub>sc</sub> = -9mA, V <sub>max</sub> = 0.14 V, I <sub>max</sub> = -6mA and cell area = 4 cm <sup>2</sup>	<b>5</b>	<b>CO4</b>
Q2.	List out the factors led to the accelerated development of wind power.	<b>5</b>	<b>CO2</b>
Q3.	A wind farm is being considered for a ridge top site. Name ten or more issues that might be considered in evaluating this site.	<b>5</b>	<b>CO2</b>
Q4.	Comment on the status of non-conventional energy sources in India and their future prospect	<b>5</b>	<b>CO1</b>
Q5.	Briefly discuss the following:  i) solar irradiance ii) solar constant iii) extraterrestrial radiations iv) terrestrial radiations	<b>5</b>	<b>CO1</b>
Q6.	Write the advantages and disadvantages of concentrating collectors over flat-plate types of solar collectors	<b>5</b>	<b>CO1</b>

**Section B(Attempt the following)**

Q7.	Prove that in case horizontal axis wind turbine maximum-power can be obtained when Exit velocity= 1/3 wind velocity.	<b>10</b>	<b>CO3</b>
Q8.	How the performance of liquid flat plate collector can be analyzed. Discuss in detail.	<b>10</b>	<b>CO5</b>
Q9.	Explain the concept of wet steam geothermal system and its effect on environment	<b>10</b>	<b>CO2</b>
Q10.	Draw the electrical layout of a typical solar PV system, state the functions of essential equipment. OR Taking a solar power content of 1W/cm <sup>2</sup> at the space-station location, calculate the area of solar panels required at 20% efficiency of conversion for power of 2000MW, 5000MW, 10000MW and 15000MW.	<b>10</b>	<b>CO3</b>

Q11	Explain the working of an open cycle and closed cycle OTEC plant.	10	CO5
<b>Section C (Attempt the following)</b>			
Q12.	<p>The low-speed shaft of a wind turbine has a length, <math>l</math>, of 10m and a diameter, <math>D</math>, of 0.5 m.</p> <p>It is made of steel with a modulus of elasticity of <math>E=160</math> GPa. It is rotating at 12.1 rpm and the turbine is generating 5MW. Find:</p> <p>(a) The applied rotor torque, assuming an overall drive train efficiency of 90%</p> <p>(b) The angle of deflection</p> <p>(c) The energy stored in the shaft</p> <p>(d) The maximum stress in the shaft.</p> <p style="text-align: center;"><b><u>OR</u></b></p> <p>A geothermal power plant uses geothermal water extracted at <math>160^{\circ}\text{C}</math> at a rate of 440 kg/s as the heat source and produces 22 MW of net power. If the environment temperature is <math>25^{\circ}\text{C}</math>, determine (a) the actual thermal efficiency, (b) the maximum possible thermal efficiency, and (c) the actual rate of heat rejection from this power plant</p>	20	CO4