UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
Online End Semester Examination, May 2021

Course: Renewable energy engineering　　　　　　　　　　Semester: VI
Program: B. Tech. Electrical　　　　　　　　　　　　　　Time 03 hrs.
Course Code: EPEG 3018　　　　　　　　　　　　　　　　Max. Marks: 100

SECTION A

1. **Each Question will carry 5 Marks**
2. **Instruction: Complete the statement / Select the correct answer(s)**

S. No.	Question	CO
Q 1	Chemical reactions triggered by _____ transform organic material into hydrocarbons. (a) solar energy (b) hydroelectric (c) elevated temperatures (d) decomposition	CO1
Q2	Solar energy stored in material such as wood, grain, sugar, and municipal waste is called _____. (a) fossil fuels (b) biomass (c) geothermal energy (d) natural gas	CO2
Q3	_____ is a physical device that can be correlated to the number of photons detected. a) Photodiode b) LEDs c) CFLs d) CFCs	CO1
Q4	Why is a transparent cover used in a flat plate collector? a) To maximize transmission of the incident sunlight into the box b) To minimize transmission of the incident sunlight into the box c) To entirely reflect the incident sunlight back d) To ensure partial transmission of the incident sunlight into the box	CO2
Q5	Which of the following best indicates photosynthesis? a) Carbon dioxide + water → oxygen + glucose b) $6CO_2 + 6H_2O → C_6H_{12}O_6 + 6O_2$ (in the presence of sunlight) c) Carbon dioxide + water → glucose + oxygen (in the presence of sunlight) d) Oxygen + glucose → carbon dioxide + water	CO2
Q6	What are the two primary aerodynamic forces acting on wind turbine rotors? a) Lift, drag b) Drag, gravitational force c) Gravitational force, lift d) Gravitational force, electrical force	CO3

SECTION B

1. **Each question will carry 10 marks**
2. **Instruction: Write short / brief notes**

Q 7	Illustrate the operation of flat plate collector and its limitation with a neat sketch.	**CO2**
Q 8	Discuss the consideration and guidelines for wind turbine selection. Also, present statistic of worldwide wind energy scenario.	**CO3**
Q 9	Explain the basic principle of biomass energy conversion and classify the different conversion processes.	**CO4**
Q 10	Derive the equivalent circuit diagram of a solar cell and present the I-V curves for variation in series resistance.	**CO2**

Q 11	Write short note on any one of the following
	    (i) Tidal energy
	    (ii) Geothermal energy
		CO4

Section C

1. **Each Question carries 20 Marks.**
2. **Instruction: Write long answer.**

| Q12 | A wind turbine has the following data:
Speed of free wind at the height of 9.8 m = 14 m/s
Air density = 1.3 kg/m3
Alpha = .15
Height of tower = 120 m
Diameter of rotor = 100 m
Wind velocity at the turbine reduced by 18%
Generator efficiency = 80%
Find
    (i)   Total power available in wind
    (ii)   Power extracted by turbine
    (iii)   Electrical power generated
    (iv)   Axial thrust on the turbine
    (v)   Maximum axial thrust on the turbine
<div align="center">OR</div>Obtain the relation for maximum power extraction from wind turbine and also derive the torque and wind speed relation for a wind turbine. | **CO3** |