ROLL NO:

PRESIDENCY UNIVERSITY, BENGALURU

SCHOOL OF ENGINEERING

TEST 2

Odd Semester: 2018-19 | **Date**: 27 November 2018

Course Code: MEC 217 | **Time**: 1 Hour

Course Name: Renewable Energy Systems | **Max Marks**: 40

Branch & Sem: MEC & VII Sem Group - I | **Weightage**: 20%

Instructions:

(i) Scientific and Non-programmable calculators are permitted.

Part A

Answer **all** the Questions. **Each** question carries **four** marks. (3x4=12)

1. With the help of a diagram, discuss the Basic components of a Wind Energy Conversion System (WECS):-

2. What are different biomass energy resources and what is the energy yield from each of them?

3. Explain the different process of conversion of biomass into useable fuels:-

Part B

Answer **all** the Questions. **Each** question carries **eight** marks. (2x8=16)

4. An aero generator generates an output of 1200 W at wind speed of 5 m/s at 1 ata. and temperature of 20^0C. What will be the output, if the same aero generator installed on the top of a hill where the temperature is 10^0C, pressure is 0.5 ata and wind speed is 6 m/s

5. A HAWT is installed at allocation 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:-

Part C

Answer the Question. Question carries **twelve** marks. (1x12=12)

6. A school in a remote place has the following energy requirements:

- Ten lamps of 100 CP that operate for 4 hours daily
- 6 computers, each 250 W that operates for 6 hours daily.
- 2 HP water pump driven by fuel engine for 2 hours daily.

Calculate the size of the *Bio-Gas Plant* and the number of cows required to feed the plant.

Assume the standard values of data where required:

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END TERM FINAL EXAMINATION

Odd Semester: 2018-19 | **Date**: 27 December 2018

Course Code: MEC 217 | **Time**: 2 Hours

Course Name: Renewable Energy Systems | **Max Marks**: 80

Programme & Sem: MECH & VII Sem (Group-1) | **Weightage**: 40%

Instructions:

(i) ***Steam tables are permitted***

Part A

Answer **all** the Questions. **Each** question carries **five** marks. (4Qx5M=20)

1. What are the merits and demerits of geothermal energy ?
2. What are the main advantages and disadvantages of Ocean wave energy ?
3. What is a Fuel cell ? Why is Fuel Cell Technology Important?
4. Explain briefly a thermoelectric Generator:-.

Part B

Answer **all** the Questions. **Each** question carries **ten** marks. (3Qx10M=30)

5. A 110 kW, 110 volt, thermoelectric generator operates between 250°C and 550°C. The average value of the seebeck coefficient is 400 x 10^{-6} V/K. The generator average resistance is 0.004 ohm. Find the *open circuit voltage*, *number of thermocouples* in series, *heat input* and *rejected* at full load. The current density in the elements is limited to 18 amp/cm^2 and the max. area is 45 cm^2
6. A hot dry rock (HRD) resource has geothermal temperature gradient at 35 K km^{-1}. The minimum useful temperature is 125 K above the surface temperature T_0. Water at flow rate of $1m^3s^{-1}$ km^{-2} is used for heat extraction. The density and sp. Heat capacity for water may be used as 1000 kg m^{-3} and 4200 J kg^{-1} K^{-1} respectively. Calculate the heat content per sq. km of HRD to a depth of 8 km, assuming ρ_r = 2700 kg m^{-3} and C_r = 820 J kg^{-1} K^{-1} .Also calculate useful average temperature, initially and after 20 years:-
7. A deep ocean wave of 2.5 m peak to peak appears at a period of 10 seconds. Find the wavelength, phase velocity and power associated with the wave.

Part C

Answer **both** the Questions. **Each** question carries **fifteen** marks. (2Qx15M=30)

8. A single basin type tidal power plant has a basin area of 3 km^2. The tide has an average range of 10 m. Power is generated during flood cycle only. The turbine stops operating when the head on it falls below 3 m. Calculate the average power generated by the pant in single filling process of the basin if the turbine generator efficiency is 0.65. Estimate the average annual energy generation of the pant:-

9. Vapor – dominated geothermal power plant of 200 MW uses saturated steam of 3 MPa pressure. The steam is throttled to a turbine at inlet pressure of 1.00 MPa. A direct contact condenser operates at a pressure of 0.225 MPa, where the cooling water is at temperature of 25 ^{0}C. The polytrophic efficiency of turbine is 0.85.

   (i) Calculate steam flow rate

   (ii) If the power plant is working half load (100 MW), calculate the condition of steam entering the turbine.

   (iii) Find the heat added to the power plant.