Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

END Semester Examination, December 2019

Programme Name: B. Tech CE+RP | **Semester : VII**

Course Name : Alternate energy sources | **Time : 03 hrs**

Course Code : CHEG 314 | **Max. Marks : 100**

Nos. of page(s) : 2

SECTION A

S. No.		Marks	CO
Q 1	Discuss 'Energy Security'. Compare this for fossil fuels, nuclear power, and renewable energy.	**4**	**CO1**
Q 2	Discuss the characteristics of air flow over an airfoil.	**4**	**CO2**
Q 3	You have the choice of short-circuiting either a battery or an illuminated photovoltaic module. Which are dangerous, which are safe and why?	**4**	**CO2**
Q 4	Calculate the period and phase velocity of a deep-water wave of 100 m wavelength. Also compute wave power if amplitude is 1.5 m.	**4**	**CO3**
Q 5	Determine the efficiency of converting a tonne of wood waste with a heating value of 21 MJ/kg. The wood waste was converted into bio-oil via the HTU process. The bio-oil yield was 45% by weight and the heating value of the bio-oil was 35 MJ/kg.	**4**	**CO5**

SECTION B

Q 6	A flat-plate collector measuring 2m X 0.8m has a loss resistance r_L = 0.13 m2/kW and a plate transfer efficiency η_{pf} = 0.85. The glass cover transmittance τ = 0.9 and absorptance of the plate is α = 0.9. Water enters at a temperature T_1 = 40 °C. The ambient temperature T_a = 20 °C and the irradiance in the plane of the collector is G = 750 W/m^2. (a) Calculate the flow rate needed to produce a temperature rise of 4 °C. (b) Suppose the pump continuous to pump at nigh owing to faulty control. Estimate the initial temperature decrease at each passage though the collector. Assume, G = 0, same pump rate T_1 = 40 °C, Ta = 20 °C.	**10**	**CO2**
Q 7	Calculate the useful heat content per square kilometer of dry rock granite to a depth of 7 km. The geothermal temperature gradient G is constant at 40°C/km. the minimum useful temperature for power generation is 140 K more than the surface temperature T_0. ρ_r = 2700 kg/m^3, C_r = 820 J/kg K. Determine the time constant for useful heat extraction using a water flow rate of 1.0 m^3/s-km^2. Also find the useful heat extraction rate initially and after 10 years.	**10**	**CO3**
Q 8	Assume a well-insulated, house requires in winter an average internal heat supply of 1 kW. Together with the free gains of lighting, etc., this will maintain an internal temperature of 20°C. It is decided to build a hot water store in a rectangular tank whose	**10**	**CO5**

	top forms the floor of the house, of area 200 m^2. The heating must be adequate for 100 days, as all the heat loss from the tank passes by conduction through the floor, and as the water cools from an initial 60 °C to a final 40 °C. 1) Calculate the volume of the tank. 2) Calculate the thermal resistivity of the heat path from the tank to the floor. 3) Suggest how the tank should be enclosed thermally. 4) Determine the energy density of the storage.		
Q9	Discuss the difference between gas turbine and an MDH generator. **(OR)** Discuss the features if an open-cycle MHD generators.	**10**	**CO4**
	SECTION-C		
Q 10	Discuss the principal of separation of oxygen using solid electrolyte membrane. Explain, how hydrogen is separated from water vapor mixture.	**20**	**CO5**
Q 11	Discuss the Electroplating problems when using lithium metal and suggest the appropriate solution to resolve it in application of lithium-ion batteries. (OR) Discuss the energy storage mechanism in electric vehicles. Outline the advantages and disadvantages of electric vehicles for (a) the user; (b) the public; and (c) the role of renewable energy.	**20**	**CO4**