Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, May 2020

Course: Renewable Energy Technology & Cogeneration **Semester: VIII**
Program: B. Tech PSE and B. Tech Electrical **Time: 03 hrs.**
Course Code: PSEG-471 **Max. Marks: 100**
Instructions: Attempt all questions.

SECTION A (30Marks)

S. No.	Multiple Choice	Marks	CO
Q1	Flat plate collector absorbs a. Direct radiation only b. Diffuse radiation only c. Direct and diffuse both d. All of the above	**2**	**CO1**
Q2	The major disadvantage of biogas plant is a. Biogas can't be filled in the bottles b. Efficiency as much as 60%. c. Hazardous Waste product obtained from digester d. Organic feed stocks used are not readily available	**2**	**CO3**
Q3	Which type of fuel cell has the maximum efficiency? a. Solid Oxide b. Phosphoric Acid c. Molten Carbonate d. Alkaline	**2**	**CO1**
Q4	OTEC energy can be tapped using the following technology a. Heat Pumps b. Heat Engines c. Heat Pipes d. Tidal Barrage	**2**	**CO4**
Q5	In semidiurnal tides which statement is correct, a. 1 high tide and 1 low tide duration of 6 hours 12.5 minutes b. 1 high tide and 2 low tide duration of 12 hours 24.5 minutes c. 2 high tides and 2 low tides duration of 6 hours 12.5 minutes d. 2 high tides and 2 low tides duration of 12 hours 24.5 minutes	**2**	**CO2**
Q6	The relation relates the average power generated per unit area by the tidal power plant with the range of tide, a. 0.235R b. $235R^2$ c. 0.225R d. $0.225R^2$	**2**	**CO2**
Q7.	Which statement is incorrect about the solar PV system a. Many cells make a module b. Many modules make an array **c.** Many arrays make strings d. Many strings make ring main system.	**2**	**CO1**
Q8	The maximum power that can be extracted from the wind energy is a. 58.26% b. 59.26% c. 57.26% d. 59.01%	**2**	**CO1**
Q9	Which among the following is the vertical axis wind turbine a. Diffuser b. Venturi c. Three Bladed d. Farm Wind mill	**2**	**CO3**
Q10	Heat to power ratio of combined cycle cogeneration is in the range of---------- a. 4.0 – 5.0 b. 1.0 – 1.7	**2**	**CO2**

	c. 2.0 – 10 d. 1.0 – 5.0		
Q11	The observed difference between the high and low water tide is 8.5 m, for a proposed tidal site. The basin area is about 0.5 square kilometer which can generate power for 3 hours in each cycle. The average available head is assumed to be 8 m, and the overall efficiency of the generation to be 70%. Then the power in HP at any instant and the yearly power output. Average specific weight of seawater is assumed 1025 kg /m3. a. $450.43*10^5$ kWh/year b. $468.78*10^5$ kWh/year c. $439.33*10^5$ kWh/year d. $480.25*10^5$ kWh/year	**5**	**CO2**
Q12	Wind at 1 standard atmospheric pressure and 15^{o}C has velocity of 15m/s, turbine diameter 120 m, operating speed of turbine = 40rpm and conversion efficiency of 35% then the total power density in the wind stream and total power generated are a. 2068.87 W/m^2 and 8184 kW b. 2011.14 W/m^2 and 8220 kW c. 2110.35 W/m^2 and 8201 kW d. 2044.64 W/m^2 and 8170 kW	**5**	**CO3**
SECTION B (50Marks)			
Q13	List out electrical energy parameters required while carrying out cogeneration system performance evaluation.	**10**	**CO3**
Q14	Tabulate various biomass conversion technologies indicating the principle products obtained from the conversion.	**10**	**CO1**
Q15	Differentiate between beam and diffused radiation.	**10**	**CO1**
Q16	Explain in detail various wind resource assessment techniques.	**10**	**CO2**
Q17	List various types of fuel cells based on their conversion efficiency and applications.	**10**	**CO4**
SECTION-C (20Marks)			
Q18	i) A process industry has decided to go for co-generation plant. Steam is available at 31.25 TPH with a pressure of 63 kg/cm2 g and 486 °C. The steam for the process is required as per the following table. Process — Steam Flow, TPH — Pressure, kg/cm2 g — Temperature, °C Process # 1 — 3.25 — 21 — 310 Process # 2 — 8.00 — 8.0 — 174 Process # 3 — 20.0 — 5.0 — 160 Arrive at a co-generation scheme with single turbine. The plant requires 4.0 MW of electrical power. Find out whether the co-generation schemes are self-sufficient or any additional power needs to be purchased from the state grid, assuming the turbine efficiency of 70 % and generator efficiency of 90%. ii) Discuss in detail potential environment impacts of harnessing Tidal and OTEC energy source.	**15** **5**	**CO2, CO3, CO4**