Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: B. Tech ET+IPR **Semester : V**
Course Name : Alternate Energy Technologies **Time : 03 hrs**
Course Code : ETEG 305 **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: All questions are mandatory.

SECTION A

S. No.		Marks	CO
Q 1	Explain in detail about the working principle of open cycle MHD with a near diagram.	4	CO1
Q 2	Discuss the environmental benefits of using hydrogen as a fuel.	4	CO2
Q 3	Explain briefly about the technical limitations of Fuel Cell technology.	4	CO3
Q 4	Discuss the effect of channel width on fuel cell performance.	4	CO4
Q 5	Explain the challenges faced to implement OTEC systems in India.	4	CO5

SECTION B

Q 6	An MHD duct consist of gas of velocity v=600x+100y+0z. The magnetic field, B=3.2T is applied in z direction. The conductivity of ionized gas is 60 mho/m. Mean collision time of electron is 10^{-10} and loading factor k = 0.65. Given width, height and length are 0.6 m, 0.35 m and 1.7 m respectively. Calculate i. Generated voltage and its gradient inside the duct ii. Indicate the direction of flow of conventional current in the load and indicate the polarities of electrodes. iii. Load voltage and its gradient caused inside the duct iv. Current density and current in the system v. Power density and Total power generated vi. Power Delivered to the load vii. Joules Heating loss in the duct viii. Efficiency of the system	10	CO1
Q 7	a. Explain the overview of research and development in the field of hydrogen storage. b. Elucidate the importance of hydrogen energy in India with respect to transportation sector.	5+5	CO2
Q 8	Explain the working principle of the following fuel cell with a neat diagram. a. PAFC b. MCFC	5+5	CO3

Q 9	Derive a mathematical expression for power output from an OWC power plant.	**10**	**CO5**
	SECTION-C		
Q 10	Derive an expression for maximum power output from a segmented electrode faraday generator. Calculate the same for the MHD having the dimensions $w = 0.6\,m\, h = 0.35\,m \wedge l = 1.7\,m$. The magnetic field strength is B = 4.2 T along h and the gas velocity is 600 m/s. Assume the performance coefficient as 0.65.	**20**	**CO1**
Q 11	Describe the following schemes for tidal energy generation, and draw all characteristic curves for each scheme. a. Single way generation b. Two way generation **(OR)** a. A simple single basin type tidal power plant has a basin area of 22 km^2. The tide has a range of 10m. The turbine stops operation when the head on it falls below 3 m. Calculate the average power generated during one filling/emptying process in MW if the turbine -generator efficiency is 74%. Take specific gravity of sea water as 1.025. b. In the Rann of Kutch with basin area of tidal project is 0.72 sq. km, with a difference of 6 m between the high and low water levels. The average available head is 5 m and the system generates electric power for 4 hours in each cycle. Assuming the overall efficiency as 80%, calculate the power in kW at any point of time and the yearly power output. Density of sea water is 1025 kg/m^3.	**10+10**	**CO5**

Name: Enrolment No:	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, December 2018

Programme Name: B. Tech ET+IPR **Semester : V**
Course Name : Alternate Energy Technologies **Time : 03 hrs**
Course Code : ETEG 305 **Max. Marks : 100**
Nos. of page(s) : 2
Instructions: All questions are mandatory.

SECTION A

S. No.		Marks	CO
Q 1	Explain in detail about the working principle of closed cycle MHD with a near diagram.	4	CO1
Q 2	Explain how hydrogen can compete with fossil fuel.	4	CO2
Q 3	Explain in the principle of operation of SOFC system with a neat diagram.	4	CO3
Q 4	Explain the water transport process in PEM fuel cell.	4	CO4
Q 5	Discuss the merits and demerits of Tidal power.	4	CO5
	SECTION B		
Q 6	Explain the basic equations of MHD power generation. State typical target design values of main parameters like a. Flow velocity b. Magnetic flux density c. Conductivity d. Loading parameter K	10	CO1
Q 7	Discuss various hydrogen storage techniques and explain any two in detail with neat diagram.	10	CO2
Q 8	Compare different types of fuel cell technologies used for powering a standalone system.	10	CO3, CO4
Q 9	Explain the working principle of closed cycle OTEC with a neat diagram.	10	CO5
	SECTION-C		
Q 10	Derive an expression for maximum power output from a continous electrode faraday generator. Calculate the same for the MHD having the dimensions $w = 0.6\,m\; h = 0.35\,m \wedge l = 1.7\,m$. The magnetic field strength is B = 4.2 T along h and the gas velocity is 600 m/s. Assume the performance coefficient as 0.65.	20	CO1
Q 11	Derive the Carnot efficiency of OTEC plant, explain the principle of open-cycle ocean energy conversion, and draw the schematic diagram indicating main equipment.	20	CO5

	(OR) a. Derive the expression for the average theoretical power generated from a single basin dual effect tidal scheme. b. Calculate the net gain obtained for the scheme considered in the previous question (8.a) if the average head difference due to pumping is 0.5R and the amount of water pumped in is 0.5Q.	**10+10**	