Name: **Enrolment No:**	UPES

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: eVehicles & Energy Storage (EPEC7023) **Semester: I**

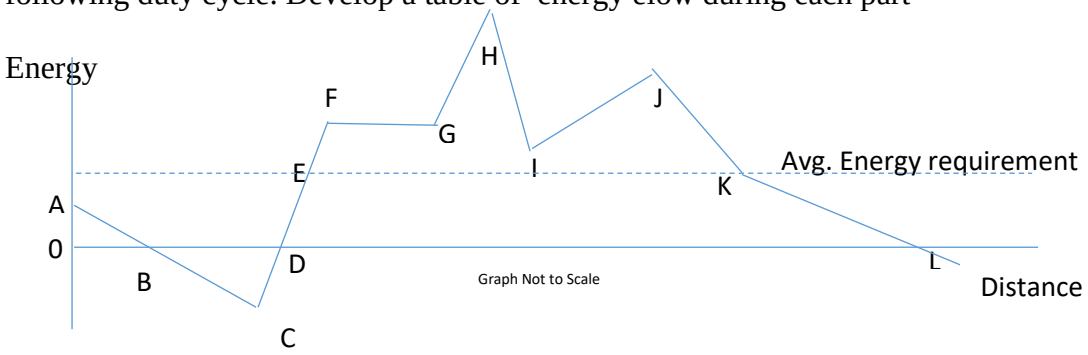
Programme: M.Tech Energy System & M.Tech Renewable Energy Engg.

Time: 03 hrs. **Max. Marks: 100**

Instructions: Clearly mention any assumptions with proper justification

SECTION A

S. No.		Marks	CO
Q 1	Justify the statement 'eV for future' can justify global emissions are concerned.	**4 M**	**CO1**
Q.2	Explain, why DC Series motor can be one of option as traction motor.	**4 M**	**CO2**
Q.3	Explain the economic consideration for selection of batteries for eVs	**4 M**	**CO3**
Q.4	Explain the Gear mechanism and role of 'clutch' in Vehicles	**4 M**	**CO4**
Q.5	Explain the need for hybridization.	**4 M**	**CO4**
	SECTION B		
Q.6	With neat diagram, explain the architecture of Hybrid eV using 'Complex' Hybrid combination.	**8 M**	**CO1**
Q.7	Explain the Rolling Resistance & Gravitational pull and explain their impact on the selection of 'Power Drive' for vehicles.	**8 M**	**CO1**
Q.8	Explain the 'constant Voltage-Hertz' control of Induction motor and explain the characteristics of IM adapted this type of control.	**8 M**	**CO2**
Q.9	Explain the SoC characteristics of battery and explain how it affects the performance of eV.	**8 M**	**CO3**
Q.10	Develop a Generic Block Diagram, using Fuzzy Logic Controller for eVs. OR Explain the need of 'Battery Optimization' and steps involved in this.	**8 M**	**CO4**
	SECTION-C		
Q.11 A	You have designed an eV with a mileage of 100 kMs at an average speed of 50 kM/hr. The maximum speed is 100 km/hr and has acceleration of 0-50 kM in 8 seconds. The designed energy consumption for various resistances & for tractive effort is as follows: Rolling resistance: 2.8%, Aerodynamic: 18% (at Max speed), Gradient (7^0) 6.3%, Passenger comfort System: 10%, Vehicle Lighting System: 4%, Transmission Losses: 10%, Rest is for Drag. The vehicle driver is driving vehicle @ 50 kM/hr, while type pressure is below standard and front windows are open. Due to open windows the Aerodynamic Drag Coefficient increased from 0.33 to 0.38 and due to poor air pressure in tyre, the coefficient of rolling resistance has increased to 0.0056 from 0.0045. If the rest parameters remain same, calculate the additional battery AH required to maintain the mileage of 100 km (at Average speed).	**10 M**	**CO1**

Q 11 B	Develope a hybrid Battery-Auxi. Battery Energy management system for the following duty cycle. Develop a table of energy elow during each part  	**10 M**	**CO3**
Q.12	Design & Estimate the power of drive train required for a eVehicle on inclined 10^0 surface with following specifications: Mass of Vehicle: 850 kg. (Without battery Bank and inc. of driver) Aerodynamic Drag Coefficient: 0.28 Coefficient of Rolling resistance: 0.004 Air Density: 1.4 kg/m^3 The frontal Area of Vehicle: 1.65 m^2 Maximum speed 100 km/hr. Neglect rise in mass of vehicle due to angular acceleration to rotating motor. The vehicle should accelerate from 0 to 70 kM/hr in 8.1 seconds. Assume motor is connected to rear wheels through gearbox of ratio 12. The diameter of tyre (wheel) is 22 inches. From the designed data, calculate the size of battery bank required for a mileage of 100 km per charge. During normal city driving consider an average acceleration of 0.28 m/s^2 and an average speed of 40 km/hr. For the battery bank design, consider proposed motor voltage rating as 60 V. If the battery specific Power to weight ratio is 180 wh/kg, estimate the weight of battery. The design engineer has proposed to revise the vehicle body shape and thus Aerodynamic drag coefficient to compensate the reduction in mileage due to additional battery weight. Estimate the new Aerodynamic drag coefficient.	**20 M**	**CO2** **CO3**