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GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Seventh Semester – Regular) Examinations, November – 2022

BPEEE7021 – Hybrid Electric Vehicle (EEE)

Time: 3 hrs

Maximum: 70 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions)

(1 x 10 = 10 Marks)

Q.1. Answer ALL questions

	[CO#]	[PO#]
a. The function of an alternator in an automobile is to	CO1	PO2
(i) Supply electric power		
(ii) Converts mechanical energy into electrical energy		
(iii) Continually recharges the battery		
(iv) Partly converts engine power into electric power		
b. Select the features of Hybrid Electric Vehicles	CO1	PO2
(i) Idle Stop		
(ii) Motor Assist		
(iii) EV Drive		
(iv) Regenerative Braking		
c. The electric motor in a hybrid car can also act as :	CO1	PO2
(i) cooling fan		
(ii) fuel pump		
(iii) generator		
(iv) None of these		
d. A series hybrid drive train is a drive train where	CO2	PO2
(i) two power sources feed a single power plant		
(ii) one power sources feed a single power plant		
(iii) One power sources feed the power plant and other source receive power		
(iv) two power sources receive power from a single power plant		
e. The most commonly used power plant in automobiles is	CO2	PO1
(i) Gas turbine		
(ii) I.C. engine		
(iii) Battery		
(iv) None of these		
f. Which of the following is true?	CO2	PO2
(i) high torque is required at the start of the vehicle		
(ii) low torque is required at high speeds		
(iii) gearbox helps in smooth running of vehicle		
(iv) all of the above		
g. How many cells are used in a 12 volt car battery	CO3	PO2
(i) 2		
(ii) 6		
(iii) 4		
(iv) 8		
h. Induction motors are widely accepted due to	CO3	PO2
(i) low cost,		
(ii) high reliability		
(iii) Maintenance-free operation		
(iv) all of the above		
i. Which is not a commutatorless based motor?	CO3	PO1
(i) Wound rotor motor		
(ii) PM brushless motor		
(iii) Field excited motor		
(iv) Reluctance motor		
j. A step - down choppers can be used in	CO4	PO2
(i) Electric traction		
(ii) Electric vehicles		
(iii) Machine tools		
(iv) All of these		

PART – B: (Short Answer Questions)

(2 x 10 = 20 Marks)

Q.2. Answer ALL questions

	[CO#]	[PO#]
a. Explain the function of clutch and torque converter?	CO1	PO2
b. List the factors considered while selecting a suitable power plant.	CO1	PO3

c. What are the different power plants used in HEV?	CO1	PO3
d. List various types of hybrid drive train topologies.	CO2	PO2
e. Mention advantages and disadvantages of series hybrid electric drive train.	CO2	PO1
f. Mention advantages and disadvantages of parallel hybrid electric drive train.	CO2	PO1
g. Explain energy storage operation with a neat block diagram.	CO3	PO2
h. Explain the function of electronic controller in Hybrid electric vehicles.	CO3	PO2
i. Write advantages of commutatorless motors compared to commutator motors.	CO3	PO1
j. Explain Simpson type transmission	CO4	PO2

PART – C: (Long Answer Questions)

(10 x 4 = 40 Marks)

Answer ALL questions

	Marks	[CO#]	[PO#]
3. a. Explain the term rolling resistance and aerodynamic drag in vehicles and derive the expression for vehicle translational speed from fundamentals.	5	CO1	PO2
b. Compare and differentiate between the battery electric vehicle (BEV), hybrid EV (HEV) and Plug-in HEV (PHEV) technologies	5	CO1	PO1
(OR)			
c. Explain the Impact of modern drive-trains on energy supplies? An electric vehicle has the following parameter values: $m = 800 \text{ kg}$, $CD = 0.2$, $AF = 2.2 \text{ m}^2$, $C0 = 0.008$, $C1 = 1.6 \times 10^{-6} \text{ s}^2/\text{m}^2$ Also, take density of air $\rho = 1.18 \text{ kg/m}^3$, and acceleration due to gravity $g = 9.81 \text{ m/s}^2$. The vehicle is on level road. It accelerates from 0 to 65 mph in 10 s, such that its velocity profile is given by $V(t) = 0.29055t^2$ for $0 \leq t \leq 10\text{s}$ (i) Calculate FTR (t) for for $0 \leq t \leq 10\text{s}$ (ii) Calculate PTR (t) for for $0 \leq t \leq 10\text{s}$ (iii) Calculate the energy loss due to non conservative forces Eloss. (iv) Calculate ΔeTR	10	CO1	PO3
4. a. What are the different classifications of series parallel hybrid train? Discuss the power flow control in EM dominated series parallel hybrid train.	5	CO2	PO2
b. With help of block diagram, explain different modes of operations of a typical parallel hybrid train.	5	CO2	PO3
(OR)			
c. Enlist different modes of operation in parallel hybrid electric vehicle technology and explain power flow control in it.	5	CO2	PO3
d. Explain different EV configurations.	5	CO2	PO2
5. a. What are the factors need to be considered in modelling a battery that can be used in hybrid electric vehicle?	5	CO3	PO2
b. Draw and explain the typical CAN system of a hybrid electric vehicle.	5	CO3	PO2
(OR)			
c. What is Fuel Cell? Explain different types of fuel cell.	5	CO3	PO2
d. Explain with neat cell structure the reactions during charging and discharging of the nickel cadmium battery.	5	CO3	PO2
6. a. Explain Different types of automatic type transmission	5	CO4	PO3
b. Write short notes on Electronic control unit (ECU).	5	CO4	PO2
(OR)			
c. Explain constant power speed ratio with a neat diagram.	5	CO4	PO2
d. Write short notes on Hydrodynamic transmission.	5	CO1	PO3

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