

## Model Question Paper-1 with effect from 2022-23 (CBCS Scheme)

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### Sixth Semester B.E. Degree Examination Hybrid Vehicle Technology( BAU613A)

TIME: 03 Hours

Max. Marks: 100

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.  
02.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Elaborate the Social and environmental importance of hybrid and electric vehicles.	4	10
	b	Explain the basics of Battery Electric Vehicle.	2	10
OR				
Q.02	a	With equations analyze the HE Vehicle model.	3	10
	b	Find the approximate rating of an EV powertrain with a vehicle weight of 1364 kg. First, determine the forces needed to accelerate at 4.47 m/s <sup>2</sup> , assuming that aerodynamic, rolling, and hill-climbing force counts for an extra 10% of the needed acceleration force.	4	06
	c	Explain EV Powertrain Component Sizing.	2	04
Module-2				
Q. 03	a	With a schematic diagram, demonstrate working of Micro Hybrid electric vehicles.	3	10
	b	With a schematic diagram, Compare series and Parallel HEV.	3	10
OR				
Q.04	a	How can active noise control be applied to reduce noise in hybrid electric vehicles?	3	10
	b	Explain series-parallel hybrid architecture combines the benefit of both series and hybrid electric vehicles.	2	10
Module-3				
Q. 05	a	Explain the working of an Induction motor with neat sketch.	2	10
	b	Explain the working of a PM synchronous motors with a neat sketch.	2	10
OR				
Q. 06	a	Compare the performance of a BLDC motor with a brushed DC motor in terms of efficiency, maintenance, and suitability for electric vehicle applications	3	10
	b	With a neat sketch the working of a SRM. Write are their benefits and limitations.	2	10
Module-4				
Q. 07	a	What are characteristics of batteries? Explain in detail	3	10
	b	Compare lead acid battery with Nickel-Metal Hydride Battery	2	10
OR				
Q. 08	a	Explain ultra-capacitor in detail and how this can be used in EV	2	10
	b	With a neat sketch, explain the working of a fuel cell.	2	10
Module-5				
Q. 09	a	Elaborate on the Matching the electric machine and the internal combustion engine (ICE) to power a Hybrid vehicle.	2	10
	b	Explain Selection of right energy storage technology for a hybrid vehicle	2	10
OR				
Q. 10	a	Classify different energy management strategies. Explain any two.	2	10
	b	Discuss the Implementation issues of energy management strategies.	3	10

## Model Question Paper-2 with effect from 2022-23 (CBCS Scheme)

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### Sixth Semester B.E. Degree Examination Hybrid Vehicle Technology( BAU613A)

TIME: 03 Hours

Max. Marks: 100

- Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**.  
02.  
03.

Module -1			*Bloom's Taxonomy Level	Marks
Q.01	a	Though electric vehicles initially succeeded during late 1800, they failed against IC Engines. Now after 2010 they are emerging again. Elaborate on the scenario and what made Electric vehicles fail and win again.	4	8
	b	How does Electric Mobility better for the world, compared to fossil fuel dependent mobility.	3	4
	c	With a block diagram, Explain the working of Battery Electric Vehicle.	2	8
OR				
Q.02	a	With equations explain the various resistive forces encountered for a moving vehicle. How this equation can be used to find the range of an Electric vehicle.	3	4
	b	A Battery electric vehicle weighs 1000kgs and has a battery capacity of 20kWH, Frontal projected area is 3m <sup>2</sup> . Motor Power = 40kW and Torque is 100Nm at high speeds and Peak torque is 140Nm at low speeds. Wheel specifications is 185/70R14. Gear ratio is 4, air density = 1.2kg/m <sup>3</sup> . Assume any missing data suitably. a. Find the air drag if coefficient of air drag is 0.4 at 40KMPH b. Find the theoretical range on a flat road for 40KMPH constant speed. c. Find the theoretical maximum speed on a level road. d. What is the maximum initial acceleration of the vehicle.	4	12
	c	How is battery and Motor size decided for an Electric Vehicle.	3	4
Module-2				
Q.03	a	How is Hybridization calculated? Compare Micro, Mild and Full Hybrid electric vehicles.	3	6
	b	Compare series and Parallel hybrids with a schematic.	3	8
	c	With a schematic diagram, show how series-parallel hybrid architecture combines the benefit of both series and hybrid electric vehicles.	2	6
OR				
Q.04	a	How do electric vehicles regenerate energy during braking. Elaborate why only a small amount of energy can be regenerated.	3	6
	b	Explain the coupling of engine and motor in a hybrid using a power split device.	2	6
	c	How does e-CVT work in a Toyota Prius.	3	8
Module-3				
Q.05	a	Explain the working of a PM synchronous motors with a neat sketch.	2	10
	b	How does 3 phase AC produce RMF. Explain the working of an Induction motor with concept of slip.	2	10
OR				
Q.06	a	Show the construction and working of a BLDC motor. Mention their advantages and limitations.	2	10

	b	With a neat sketch the working of a switched reluctance motors. What are their benefits and limitations.	2	10
	c			
<b>Module-4</b>				
Q. 07	a	Why are li-ion batteries preferred over lead acid batteries for vehicle propulsion.	3	6
	b	What are the types of charging and explain CC-CV charging with a graph.	2	8
	c	Explain how flywheels could be used as energy source in electric vehicles	2	6
OR				
Q. 08	a	What are unique characteristics of Super capacitor and how this can be used in electric vehicles.	2	6
	b	With a neat sketch, explain the working of a fuel cell.	2	8
	c	Describe the characteristics of fuel Cell such as Efficiency, Durability, Specific power and freeze capacity.	2	6
<b>Module-5</b>				
Q. 09	a	Elaborate on the Matching the electric machine and the internal combustion engine (ICE) to power a Hybrid vehicle.	2	10
	b	We know that, power electronics devices are used in Electric or Electric Hybrid Vehicle. Explain their functions and typical power losses in each of these components.	2	10
OR				
Q. 10	a	What are the energy management strategies used in hybrid and electric vehicle, classify different energy management strategies.	2	10
	b	Compare the different energy management strategies. What are the implementation challenges.	3	10

\*Bloom's Taxonomy Level: Indicate as L1, L2, L3, L4, etc. It is also desirable to indicate the COs and POs to be attained by every bit of questions.