Roll No.												

PRESIDENCY UNIVERSITY

BENGALURU

End - Term Examinations – MAY/ JUNE 2025

Date: 03-06-2025 **Time:** 09:30 am – 12:30 pm

School: SOE	**Program:** B.Tech	
Course Code : EEE3048	**Course Name:** Power Electronics Applications for Electrical Vehicles	
Semester: VI	**Max Marks**: 100	**Weightage**: 50%

CO - Levels	**CO1**	**CO2**	**CO3**	**CO4**	**CO5**
Marks	**14**	**24**	**14**	**24**	**24**

Instructions:

(i) Read all questions carefully and answer accordingly.

(ii) Do not write anything on the question paper other than roll number.

Part A

Answer ALL the Questions. Each question carries 2marks. **10Q x 2M=20M**

1.	List the main power electronic components used in electric vehicles.	2 Marks	L1	CO1
2.	Explain why lithium-ion batteries are widely used in EVs.	2 Marks	L2	CO1
3.	State the role of lateral dynamics in maintaining vehicle stability during cornering and high-speed maneuvers.	2 Marks	L1	CO2
4.	Summarize the benefits of a series-parallel (power-split) hybrid system	2 Marks	L2	CO2
5.	List the major losses associated with BJTs and MOSFETs.	2 Marks	L1	CO3
6.	List the types of switched-mode power converters.	2 Marks	L1	CO3
7.	List reasons why dynamic modeling is required in system analysis.	2 Marks	L1	CO4
8.	List the types of control techniques used in EV inverters.	2 Marks	L1	CO4
9.	List the key characteristics of a battery.	2 Marks	L1	CO5
10.	Explain the basic concept of electrochemistry.	2 Marks	L2	CO5

Part B

Answer the Questions. Total Marks 80M

11.	a.	Describe how EV body design differs from ICE vehicle design.	5 Marks	L2	CO1
	b.	Analyze the impact of EVs on reducing India's oil import bill.	5 Marks	L4	CO1
		Or			
12.	a.	Differentiate between challenges faced in rural vs. urban EV adoption.	5 Marks	L2	CO1
	b.	Compare ICE vehicles and EVs in terms of running cost per kilometer.	5 Marks	L4	CO1

13.	a.	Explain the advantages of using a Hybrid Energy Storage System (HESS) over a single energy storage system in EVs.	10 Marks	L2	CO2
	b.	An HEV operates in electric mode for 30 minutes using a 50 kW motor powered by a 300V battery. The battery has an efficiency of 95%. Determine the required battery capacity in kWh and the current drawn from the battery.	10 Marks	L3	CO2
		Or			
14.	a.	Explain the different possible Hybrid Electric Vehicle (HEV) configurations and how they integrate various energy sources.	10 Marks	L2	CO2
	b.	A hybrid electric vehicle (HEV) needs an electric motor to provide a peak torque of 150 Nm at a maximum speed of 5000 rpm. The motor efficiency is 90%. Determine the required power rating (in kW) for the motor.	10 Marks	L3	CO2

15.	a.	A buck converter uses a MOSFET as the switching device. Given the following parameters, calculate: (1) DC Efficiency (2) AC Efficiency (3) Total Efficiency of the buck converter. Given Data: input voltage 24 V, Output voltage 12V, Output current 5 A, MOSFET on-resistance 0.05 ohm, Inductor resistance 0.1 ohm, switching frequency 100 k Hz, MOSFET Rise Time 50 ns, MOSFET fall Time 75 ns.	5 Marks	L4	CO3
	b.	Describe the power transfer process in a forward converter.	5 Marks	L1	CO3
		Or			
16.	a.	Describe the difference between linear and switched-mode converters.	5 Marks	L1	CO3
	b.	Analyze why MOSFETs have lower switching losses than BJTs.	5 Marks	L4	CO3

17.	a.	Differentiate between rotor construction in BLDC and AC induction motors.	10 Marks	L2	CO4
	b.	Describe the switching sequence for a single phase full-bridge inverter 50Hz AC output.	10 Marks	L2	CO4
		Or			
18.	a.	Differentiate between full-bridge and half-bridge inverter topologies.	10 Marks	L2	CO4

	b.	Describe the speed control function of the BLDC motor through a block diagram.	10 Marks	L2	CO4

19.	a.	Explain how the Resistive Thevenin model represents a battery.	10 Marks	L2	CO5
	b.	Explain the challenges involved in managing large battery packs.	10 Marks	L2	CO5
		Or			
20.	a.	Explain the impact of high discharge rates on terminal voltage.	10 Marks	L2	CO5
	b.	Describe an accurate electrical battery model.	10 Marks	L2	CO5