

	ARKA JAIN University Jharkhand		NAAC GRADE A ACCREDITED UNIVERSITY		END SEM EXAMINATION School of Engineering & IT	
Branch	Electrical Vehicle Technology		Program	M.Tech		
Subject Name	EV Charging Infrastructure and Analysis		Semester	2 nd		
			Year	2025/Even		
Time: 3 Hour Max. Marks : 70	• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • Graf Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) • Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under <u>Unfair Means</u> and will <u>Result in the Cancellation of the Paper(s)</u>.					
	Knowledge Level (KL)	K1 : Remembering		K3 : Applying		K5 : Evaluating
K2 : Understanding		K4 : Analysing		K6 : Creating		

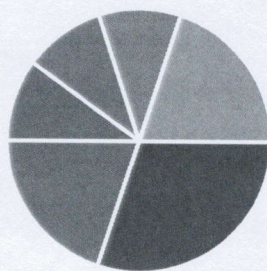
Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)						
Q. N1	QUESTIONS			Marks	COs	KL
i	What is a Battery Swapping Station?			2	CO1	K1
ii	Name the types of chargers based on current type.			2	CO4	K2
iii	What is EV penetration?			2	CO3	K1
iv	Define smart charging technology.			2	CO3	K2
v	What is the purpose of an earth protection system in charging stations?			2	CO5	K1
vi	Define dumb charging in electric vehicle charging.			2	CO4	K2
vii	What does OCPP stand for?			2	CO4	K1
viii	Mention the two differences between CCS-1 and CCS-2 connectors.			2	CO2	K2
ix	What does V2G stand for?			2	CO3	K1
x	Define IoT in the context of EV communication.			2	CO2	K2

CO- Course Outcomes, **KL- Knowledge Level,** **PO – Program Outcome**

CO1	Analyse the impact of EV charging on power grid.
CO2	Design the various charging infrastructures and their selection and sizing.
CO3	Analyse the various charging infrastructures.
CO4	Evaluate the various charging methodologies and analyse their performances.
CO5	Design the charger specifications along with study and selection of communication protocol for various charging ports.

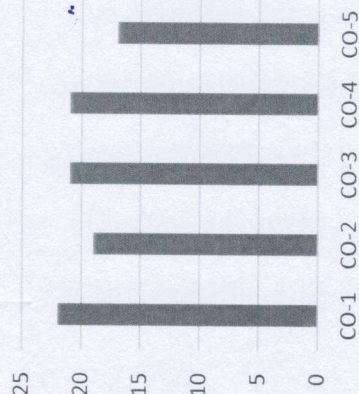
GRAPHICAL REPRESENTATION

Bloom's level wise Marks Distribution



■ K1 ■ K2 ■ K3 ■ K4 ■ K5 ■ K6

Course Outcome wise Marks Distribution



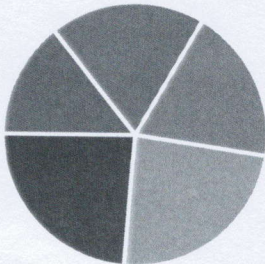
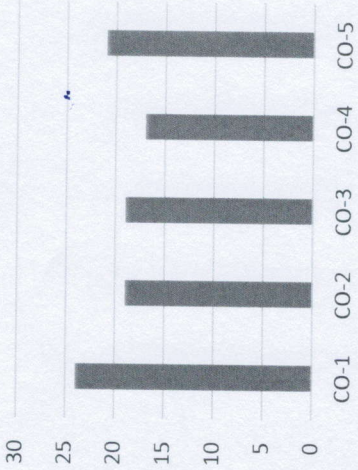
Section B (Answer any FOUR out of SIX) – 20 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	Write down the difference between Level 1 and Level 2 charging?	05	CO1	K4
3	Compare AC and DC charging in terms of speed, cost, and compatibility.	05	CO4	K4
4	Identify the weaknesses in the safety system of an improperly grounded charging station.	05	CO2	K4
5	Explain the role of communication gateway in EVSE.	05	CO1	K3
6	Explain how IoT enables real-time performance monitoring in EVs.	05	CO5	K3
7	Describe the working principle and architecture of OCPP-based charging systems.	05	CO3	K4

Section C (Answer any THREE out of FIVE) – 30 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
8	Assess the environmental and economic benefits of high EV adoption in urban areas.	10	CO1	K5
9	Evaluate the suitability of battery swapping for electric two-wheelers and three-wheelers.	10	CO2	K6
10	Assess the impact of different EV charging strategies on peak demand and load balancing in the power grid.	10	CO3	K5
11	Evaluate different communication methodologies used in DC fast chargers and identify the most efficient in terms of real-time control and fault handling.	10	CO5	K6
12	Evaluate the feasibility of using V2G technology as a backup power solution in residential communities.	10	CO4	K5

ARKA JAIN University Jharkhand		NAAC GRADE A ACCREDITED UNIVERSITY		END SEM EXAMINATION School of Engineering & IT	
Program	M.Tech	Branch	Electrical Vehicle Technology		
Subject Name	Industrial Drives and Control		Session	Even, 2024-25	
Semester	2 nd	Year	2025		
Time: 3 Hour Max. Marks : 70		• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • Graf Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) • Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under <u>Unfair Means</u> and will Result in the Cancellation of the Paper(s).			
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating		
	K2 : Understanding	K4 : Analysing	K6 : Creating		
Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)					
Q. N 1	QUESTIONS		Marks	COs	
i	What is the function of freewheeling diode?		2	CO1	
ii	Compare Individual, Group and Multimotor drives.		2	CO1	
iii	Why we go for PWM inverter control?		2	CO2	
iv	Draw the block diagram of Electric Drive.		2	CO2	
v	Differentiate Mechanical and Electrical Braking.		2	CO3	
vi	What is meant by Cyclo converter? Write the types of cyclo converter.		2	CO3	
vii	Classify chopper considering their quadrant operation.		2	CO4	
viii	What is VVVF control?		2	CO5	
ix	Mention the Classifications of Braking.		2	CO5	
x	Write the classification of Electric Drives.		2	CO5	
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)					

CO- Course Outcomes,		KL- Knowledge Level,	PO – Program Outcome
Course Outcomes	CO1	Understanding of various industrial motors and their applications.	
	CO2	Proficiency in motor drive control techniques (speed, torque, vector control, DTC).	
	CO3	Design and implementation of motor drive systems using power electronics.	
	CO4	Application of closed-loop control systems for speed, position, and torque regulation.	
	CO5	Knowledge of modern trends in energy-efficient drives and integration with renewable energy systems..	
GRAPHICAL REPRESENTATION			
Bloom's level wise Marks Distribution		Course Outcome wise Marks Distribution	
 ■ K1 ■ K2 ■ K3 ■ K4 ■ K5			

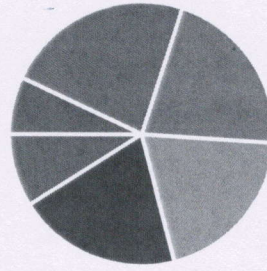
Q. No.	QUESTIONS	Marks	COs	KL
2	A step up chopper has an input voltage of 150V. The voltage output needed is 450V. Given, that the thyristor has a conducting time of 150 seconds. Calculate the chopping frequency.	05	CO1	K4
3	A semi converter operated from single phase 230 volt, 50 Hz supply drives a 10HP, 200 volt, 1500rpm, separately excited DC motor. The rated armature current is 40A, the motor parameters $R_a=0.5\Omega$, $L_a=10\text{mH}$. $K_a\phi$ constant $=0.2\text{V/rpm}$. Find out the following parameters $\alpha = 30^\circ$ i) average armature voltage, ii) back emf of motor iii) speed of motor iv) motor torque.	05	CO2	K5
4	Explain the different methods of speed control employed in DC Shunt Motor.	05	CO3	K1
5	Explain the control of DC drives using rectifiers and choppers.	05	CO4	K2
6	A chopper circuit is operating on TRC at a frequency of 2 KHZ on a 460 V supply. If the load voltage is 350 volts, calculate the conduction period of the thyristor in each cycle	05	CO5	K5
7	Explain the speed control schemes of DC Series Motor.	05	CO1	K2
Section C (Answer any THREE out of FIVE) - 30 Marks- (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain with neat circuit diagram, the star-delta starter method of starting squirrel cage induction motor.	10	CO1	K3
9	Input to the step up chopper is 200 V. The output required is 600 V. If the conducting time of thyristor is 200 μsec . Compute – Chopping frequency, – If the pulse width is halved for constant frequency of operation, find the new output voltage.	10	CO2	K3
10	Name the Classification of Choppers. Explain any one of them.	10	CO3	K2
11	Explain the principle Step-up Chopper with circuit diagram. A Chopper circuit is operating on TRC at a frequency of 2 kHz on a 460 V supply. If the load	10	CO4	K4

12	voltage is 350 volts, calculate the conduction period of the thyristor in each cycle.	10	CO5	K4
	Draw the Characteristics of dc series motor with their relations.			

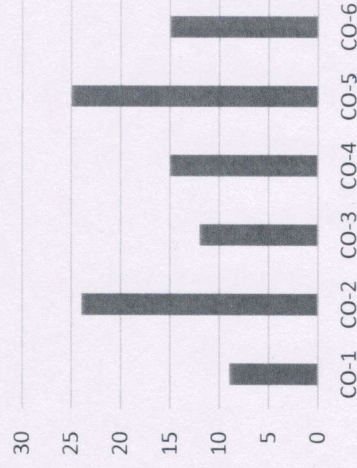
CO1	Understand the Fundamentals of Electric Vehicles (EVs)
CO2	Create awareness among students about the concepts of electric vehicle system engineering.
CO3	Enable the students to investigate the various testing methodologies of EV.
CO4	Equip the students with knowledge and enable them to perform EV Modelling & Simulation.
CO5	To impart the knowledge of electric vehicle policy.
CO6	To study the different types of testing for EV.

GRAPHICAL REPRESENTATION

Bloom's level wise Marks Distribution



Course Outcome wise Marks Distribution

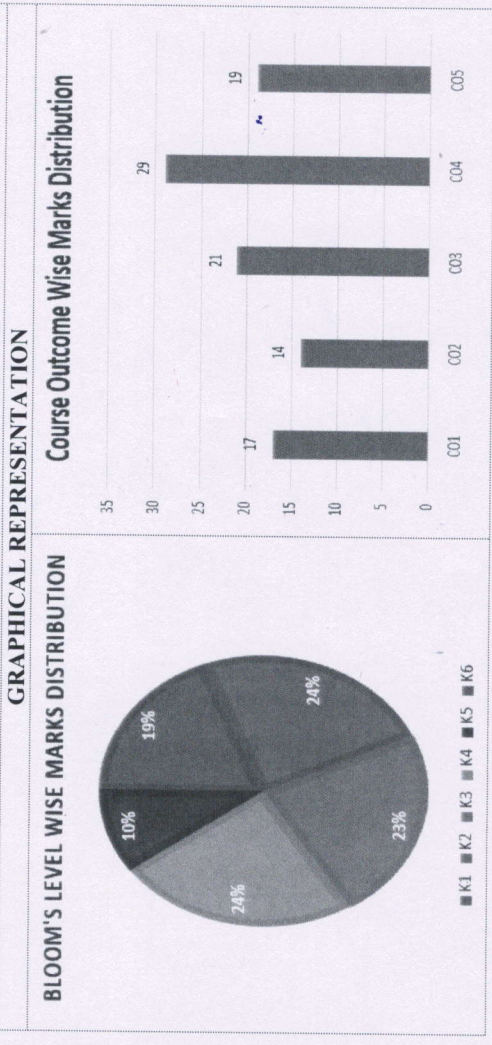


 ARKA JAIN University Jharkhand		NAAC GRADE A ACCREDITED UNIVERSITY		END SEM EXAMINATION School of Engineering & IT	
Program	M. Tech	Electric Vehicle System Engineering and Policy		Branch	Electric Vehicle Technology
Subject Name		II		Session	Even, 2024-2025
Semester				Year	June, 2025
Time: 3 Hour Max. Marks : 70		• Start writing from 2nd page onwards; don't Write on the 1st Page Backside • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • Graf Paper / Drawing Sheet/ Log Book/ Ledger (please Mention-if any) • Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Paper(s).			
Knowledge Level (KL)	K1 : Remembering		K3 : Applying		K5 : Evaluating
	K2 : Understanding		K4 : Analysing		K6 : Creating

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)					
Q.N	QUESTIONS	Marks	COs	KL	
i	Write any two safety aspects of EV.	2	CO1	K1	
ii	Enlist any two security aspects of EV.	2	CO2	K1	
iii	What is Power train.	2	CO3	K1	
iv	Classify the type of drive cycles in EV.	2	CO1	K2	
v	What are communication protocols for EV?	2	CO4	K2	
vi	Define the drive cycles.	2	CO5	K1	
vii	What are on-road electric vehicles testing?	2	CO6	K2	
viii	What do you mean by battery electric vehicle safety?	2	CO1	K1	
ix	How Aerodynamic Drag work?	2	CO2	K3	

x	Illustrate the reliability index investigation on EV.	2	CO3	K3
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	How the Sizing of Components for EV is decided?	05	CO3	K3
3	Draw and explain the modeling of Vehicle Chassis.	05	CO4	K4
4	Discuss the policy formulation and implementation at various levels of government of India for EV.	05	CO3	K3
5	Enlist the different types of criteria for connecting EV to utility for AC level 1 and level 2 charging.	05	CO2	K2
6	Highlight the examples of policies and incentives for EV adoption in India.	05	CO5	K5
7	Explain the electromagnetic compatibility testing for EV.	05	CO6	K3
Section C (Answer any THREE out of FIVE) – 30 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Draw and discuss the communication standards- communication architecture for DC fast charging.	10	CO4	
9	Discuss the nature and scope of policies to stimulate widespread EV adoption and support EV/CI station implementation.	10	CO5	
10	Highlight and explain the different criteria for connecting EV to utility for AC level 1 and level 2 charging.	10	CO2	K3
11	Explain the algorithms for modeling of Brake Control Unit in EV.	10	CO4	K4
12	Discuss about the usage pattern for electric vehicles, Standardization in e-mobility, Government policies: standards and regulation	10	CO5	K3

CO- Course Outcomes,		KL- Knowledge Level,	PO – Program Outcome
Course Outcomes	CO1	To understand the fundamentals of electronic product design and development.	
	CO2	To gain knowledge of hardware and software integration in electronic products.	
	CO3	To develop skills in circuit design, PCB layout, prototyping, and testing.	
	CO4	To learn about product ergonomics, aesthetics, and user experience.	
	CO5	To explore design for manufacturability (DFM) and design for testing (DFT)	



Program	M.Tech	Branch	Electrical Vehicle Technology
Subject Name	Electronic Product Design		
Semester	II	Session	Even, 2024-2025
		Year	June, 2025
Time: 3 Hour Max. Marks : 70 - Start writing from 2nd page onwards; don't Write on the 1st Page Backside - Answer all Questions of Section A (Compulsory) - Answer Any Four out of Six of Section B - Answer Any Three out of Five of Section C - Graf Paper / Drawing Sheet/ Log Book/ Ledger (please Mention if any) - Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Paper(s).			
Knowledge Level (KL)	K1 : Remembering		K5 : Evaluating
	K2 : Understanding		K6 : Creating
	K3 : Applying		

Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)					
Q.N	QUESTIONS	Marks	COs	KL	
1					
i	What is the product lifecycle?	2	1	KL.1	
ii	What is signal integrity?	2	2	KL.1	
iii	Define thermal management in PCBs.	2	5	KL.2	
iv	What is rapid prototyping?	2	5	KL.3	
v	What is debugging in embedded systems?	2	3	KL.2	
vi	Give an example of a microcontroller.	2	4	KL.3	
vii	Define threshold voltage of a MOSFET.	2	3	KL.4	
viii	What is channel length modulation?	2	2	KL.3	
ix	What is a CMOS inverter?	2	3	KL.4	
x	Define rise time and fall time.	2	4	KL.3	

Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	Describe the stages of electronic product development.	05	1	KL1
3	Explain design thinking with a real-world example.	05	2	KL4
4	Explain the structure and operation of an n-channel MOSFET.	05	3	KL4
5	What are the challenges in embedded system debugging?	05	5	KL3
6	Explain briefly the fabrication of CMOS.	05	4	KL2
7	Compare Eagle and KiCad PCB design tools.	05	2	KL2
Section C (Answer any THREE out of FIVE) – 30 Marks (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the concept of design thinking and its application in electronic innovation.	10	1	KL1
9	Compare CMOS NAND and NOR gates with diagrams.	10	4	KL2
10	Discuss scaling techniques and their impact on VLSI performance.	10	3	KL5
11	Draw and explain the stick diagram of a CMOS inverter.	10	4	KL4
12	Explain embedded system design using STM32 or Arduino.	10	5	KL3

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Branch	Electrical Vehicle Technology	Program	M. Tech	
Subject Name	Hybrid and Electric Vehicle	Semester	2 nd	
		Year	Even 2024-2025	
Time: 3 Hour Max. Marks : 70		• Start writing from 2nd page onwards; <u>don't Write on the 1st Page Backside</u> • Answer all Questions of Section A (Compulsory) • Answer Any Four out of Six of Section B • Answer Any Three out of Five of Section C • <u>Graf Paper / Drawing Sheet/ Log Book/ Ledger</u> (please Mention if any) • Possession of Mobile Phone or any kind of Written Material, Arguments with the Invigilator or Discussion with Co-Student will comes under <u>Unfair Means</u> and will <u>Result</u> in the <u>Cancellation of the Paper(s)</u>.		
Knowledge Level (KL)	K1 : Remembering	K3 : Applying	K5 : Evaluating	
	K2 : Understanding	K4 : Analysing	K6 : Creating	
Section A (Each question Carry 02 Marks from Q1-i to x – 20 Marks)				
Q. N1	QUESTIONS		Marks	COs
i	What is the difference between series and parallel hybrid vehicle control strategies?		2	CO1
ii	Define the role of a control system in electric vehicles		2	CO2
iii	What is the primary energy storage device used in electric vehicles (EVs)		2	CO3
iv	Mention one challenge in designing thermal management systems for EVs		2	CO3
v	How does a DC-DC converter contribute to the overall efficiency of an EV?		2	CO1
vi	How is torque controlled in PMSMs used in EVs?		2	CO4
vii	Mention one optimization strategy for improving induction motor efficiency in EV/HEV applications.		2	CO4
viii	Why are induction motors commonly used in electric and hybrid electric vehicles?		2	CO4
ix	Name two types of DC-DC converters commonly used in EV and HEV applications.		2	CO3

CO- Course Outcomes,

KL- Knowledge Level,

PO – Program Outcome

Course Outcomes	CO1	Explain performance characteristic and model dynamics of hybrid and electric vehicles
	CO2	Analyse the architecture of drive trains and electric propulsion units of electric and hybrid vehicles.
	CO3	Analyse various energy storage devices used in hybrid and electric vehicles and select the electric drive system
	CO4	Explore energy management strategies used in hybrid and electric vehicles

GRAFICAL REPRESENTATION



x	What is the function of the power control unit in a hybrid vehicle?	2	CO3	K3
Section B (Answer any FOUR out of SIX) – 20 Marks (Each question Carry 05 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
2	Compare the performance of EV and HEV?	05	CO2	K4
3	Explain about the vehicle power plant characteristics?	05	CO4	K3
4	Explain about the social and environmental importance of EV and HEV	05	CO3	K5
5	Explain the modern drive train on energy supplies?	05	CO3	K5
6	Explain the impact of modern drive trains on energy supplies	05	CO4	K5
7	Why a gear system is needed for an ICE? Explain with relevant characteristics curve?	05	CO2	K4
Section C (Answer any THREE out of FIVE) – 30 Marks- (Each question Carry 10 Marks)				
Q. No.	QUESTIONS	Marks	COs	KL
8	Explain the general electric vehicle configuration with a block diagram?	10	CO4	K4
9	Explain the components of HEV and its type?	10	CO3	K3
10	Differentiate between complex hybrid and series parallel hybrid configuration?	10	CO1	K5
11	Explain the mathematical models to describe the vehicle performance?	10	CO2	K5
12	Explain about the vehicle power plant characteristic?	10	CO3	K4