H.T No: 　　　　　　　　　　 **R22**

CMR COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC AUTONOMOUS)

Examination	:	M.Tech I Semester Regular & Supplementary Examinations March-2025
Course Name	:	Machine Modelling and Analysis
Course Code	:	B443401
Branch	:	Power Electronics
Date & Session	:	17-03-2025 AN 　　　Duration: 3 hours 　　　Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark. 　　　　　　　10x1=10M

1.	What is generalized theory of electrical machines?	1 M
2.	Define power-invariance?	1 M
3.	Define Linear transformation?	1 M
4.	Why do we need to transform one reference frame to another?	1 M
5.	Write current equations of 2-axis model of 3-phase induction motor in stator reference frame?	1 M
6.	Write torque equation of 2-axis model of 3-phase induction motor?	1 M
7.	List the differences between Induction motor and Synchronous motor modelling?	1 M
8.	Draw d-q model of 3-phase synchronous motor?	1 M
9.	List out the advantages of Permanent Magnet Synchronous motor?	1 M
10.	Write the applications of Brushless DC Motor?	1 M

PART-B
Answer the following. Each question carries TEN Marks. 　　　　　5x10=50M

11.A). A 10 kW, 230V, 1500 rpm DC motor has the following constants: $R_a = 1.0\Omega$; $L_a = 0.104H$; $k_m = 4.00$ Nm/armature-amps; $J = 1.00$ kg-m^2; The load coupled with the motor has its inertia equal to 1.00 kg-m^2. If the load torque varies linearly with speed, then calculate undamped natural angular frequency, damping ratio and investigate its dynamic behavior. Neglect rotational losses. 　　10M

OR

11. B). Derive the expression for developed torque in a dc series motor? 　　10M

12. A). Explain in detail about park's transformation? 　　10M

OR

12. B). Explain the importance of phase and active transformations in case of AC motors? 　　10M

13. A). Solve the state space model of a 3-φ induction motor with i) Stator reference frame ii) Rotor reference frame? 　　10M

OR

13. B). Model the basic circuit model of 3-φ induction motor solve voltage equations in terms of stator and rotor currents in the matrix form? 　　10M

(P.T.O..)

14. A). Solve the torque equation of 3-phase synchronous motor from the model of the motor?   10M

OR

14. B). Model and explain the generalized diagram of a 3-phase synchronous motor with field   10M
and damper windings on the rotor?

15. A). Model 2-axis model of Permanent magnet Synchronous motor and explain?   10M

OR

15. B). Examine voltage and current equations of 2-axis model of Brushless DC motor in state-   10M
space model?

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	M.Tech I Semester Regular & Supplementary Examinations March-2025
Course Name	:	Electric Vehicles and Design
Course Code	:	B443408
Branch	:	Power Electronics
Date & Session	:	19.03.2025 AN

Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)
PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1. List out the parameters considered for measuring the performance of a vehicle. — 1 M
2. Define grading resistance. — 1 M
3. State fuel efficiency. — 1 M
4. What is the structure components in electric vehicle? — 1 M
5. List out the sub systems in EV. — 1 M
6. What are the types of control of drives? — 1 M
7. Mention the difference between capacitor and super capacitor. — 1 M
8. What is fuel cell? — 1 M
9. Define energy management. — 1 M
10. Write the two comparisons of different energy management strategies. — 1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). Describe how to measure the basic vehicle performance. — 10M

OR

11. B). Briefly describe the vehicle power source characteristics. — 10M

12. A). Analyze the series-parallel configuration of hybrid drive train topology. — 10M

OR

12. B). Explain in detail the impact of modern drive trains on energy supplies. — 10M

13. A). Briefly explain the configuration and control of switched reluctance motor drives in electric vehicle. — 10M

OR

13. B). Analyze the configuration and its control of DC motor drives in electric vehicle. — 10M

14. A). What are parameters involved for sizing propulsion motor and explain? — 10M

OR

14. B). Explain the fuel cell-based energy storage in electric vehicle. — 10M

15. A). Discuss the issues for implementation of energy management strategies. — 10M

OR

15. D). Analyze the design of battery electric vehicle (BEV). — 10M

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CMR COLLEGE OF ENGINEERING & TECHNOLOGY
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Examination	:	M.Tech I Semester Regular & Supplementary Examinations March-2025
Course Name	:	Advanced Power Electronic Converter-I
Course Code	:	B443301
Branch	:	Power Electronics
Date & Session	:	21.03.2025 AN　　　Duration: 3 hours　　　Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.　　　　　　　　10x1=10M

1. Power MOSFET is a voltage controlled device, justify?　　　1 M
2. List the applications of power integrated circuits.　　　1 M
3. What is the condition for ideal dual converter operation?　　　1 M
4. Define harmonic factor?　　　1 M
5. List out the different advanced modulating techniques for improvement of performance.　　　1 M
6. What are the performance parameters for the single phase inverters?　　　1 M
7. What is space vector modulation?　　　1 M
8. Differentiate the 180 degree and 120 degree conduction operation in three phase inverter.　　　1 M
9. What is the primary advantage of using multi-level inverters over traditional two-level inverters?　　　1 M
10. What role do voltage balancing and clamping diodes play in the operation of a multi-level inverter?　　　1 M

PART-B
Answer the following. Each question carries TEN Marks.　　　　5x10=50M

11.A). Explain the operation of Insulated Gate Bipolar Transistor with the help of symbolic representation and its equivalent circuit.　　　10M

OR

11. B). Explain the differences between MOSFET, IGBT and MTO.　　　10M

12. A). Explain the operation of a 12-pulse converter with the help of a neat schematic and waveforms. Show that the lowest order harmonic present in the input current is 11th.　　　10M

OR

12. B). Explain single phase fully controlled converter operation with neat wave forms.　　　10M

13. A). Explain the Multiple PWM control of single phase bridge inverter with neat circuit diagram and waveforms.　　　10M

OR

13. B). Demonstrate the single phase bridge inverter control by
i) 60 Degree PWM　　　ii) Third Harmonic injection PWM?　　　10M

(P.T.O..)

14. A). Explain the principle of sinusoidal PWM applied to three phase inverter using the necessary circuit diagram and waveforms.   10M

OR

14. B). With neat sketches, explain the operation of three phase voltage source inverter. Draw phase and line voltage waveforms on the assumption that each thyristor conducts for 180° and the resistive load is star connected.   10M

15. A). Explain the working of three-level diode-clamped multilevel inverter with the help of a neat schematic and waveforms.   10M

OR

15. B). Draw the schematics of cascaded multilevel inverter and flying-capacitors multilevel inverter. Explain the need for multilevel inverters.   10M

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Examination   : M.Tech I Semester Regular & Supplementary Examinations March-2025
Course Name   : Electrical Drives
Course Code   : B443302
Branch   : Power Electronics
Date & Session   : 24-03-2025 AN   Duration: 3 hours   Max. Marks: 60

(Note: Assume suitable data if necessary)

PART-A
Answer all TEN questions
Each question carries ONE mark.   10x1=10M

1. What is an Electrical drive?   1 M
2. Write the motor equations of closed loop control of DC drive.   1 M
3. What is the principle operation of a chopper?   1 M
4. What is pulse width modulation?   1 M
5. Draw the phasor diagram of static Krammer drive.   1 M
6. What is constant V/f control of hysteresis current controller?   1 M
7. What is slip power recovery drives?   1 M
8. What is the principle of hysteresis current controller?   1 M
9. Write the Adaptive control principle of Induction motor drives.   1 M
10. What are the control strategies uses in synchronous motor drives?   1 M

PART-B
Answer the following. Each question carries TEN Marks.   5x10=50M

11.A). A 220V, 750 rpm, 200A separately excited DC motor has an armature resistance of 0.05 ohm. Armature is fed from a three phase circulating current type dual converter, which consists of full converter-A and full converter-B. Line voltage of AC source is there phase 400V. Calculate firing angles of converters for the following conditions. (Assuming continuous conduction). i) Motoring operation at rated torque and 600 rpm ii) Regenerative braking operation at rated torque and 600 rpm?   10M

OR

11. B). Explain the three phase converter controlled DC motor drive.   10M

12. A). Briefly explain the design of current controller and speed controlled drive system of closed loop operation.   10M

OR

12. B). Explain the steady state analysis of chopper controlled DC motor drives.   10M

13. A). Explain the speed-torque characteristics with variable voltage and variable frequency of Induction motor.   10M

OR

13. B). Explain the speed control of Krammer drive of Induction motor drives.   10M

14. A). Discuss the concept of Direct and Indirect vector control.   10M

OR

14. B). Explain the Direct vector control of AC motors.   10M

15. A). Explain the operation and characteristics of synchronous motor.   10M

OR

15. B). Explain the constant mutual flux linkage control.   10M

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