

Name: Enrolment No:			
UPES End Semester Examination, Dec 2025 Course: Electrical motors & Drives Semester: VII Program: B.Tech. ADE Time : 03 hrs. Course Code: MEAD 4026 Max. Marks: 100 No. of pages: 2			
SECTION A (5Qx4M=20Marks)			
S. No.		Marks	CO
Q 1	Why is the squirrel cage induction motor used in electric vehicle (EV) applications instead of the slip ring induction motor?	4	CO2
Q 2	Substantiate the two variants of PMSM motor based on rotor types.	4	CO2
Q 3	What do you understand by rotating magnetic field (RMF) in AC machine?	4	CO1
Q 4	Illustrate the purpose of Hall sensor in BLDC motor.	4	CO2
Q 5	Sketch the four-quadrant operation of an electric drive.	4	CO1
SECTION B (4Qx10M= 40 Marks)			
Q 6	Substantiate the two variants of BLDC motor based on rotor types. Also draw a comparative table for the parameters such as torque, speed, heat dissipation, efficiency.	10	CO3
Q 7	Draw the DC motor (Series, shunt, cumulative compound, differential compound) characteristics for torque vs armature current, speed vs armature current and torque vs speed.	10	CO2
Q 8	How induction motor is different from DC brushed motors. Also compare the two types of rotors being used in induction motor.	10	CO2
Q 9	A 250V, dc shunt motor has shunt field resistance of 250 Ω and an armature resistance of 0.25 Ω . For a given load torque and no additional resistance included in the shunt field circuit, the motor runs at 1500 rpm, drawing an armature current of 20 A. If a resistance of 250 Ω is inserted	10	CO3

	in series with the field, the load torque remaining the same, find out the new speed and armature current.		
SECTION-C (2Qx20M=40 Marks)			
Q 10	Develop a mathematical model of a BLDC motor. Formulate the electrical (voltage, flux, back-EMF) and mechanical (torque, dynamics) equations. Using your model, simulate the steady-state torque for different phase currents.	20	CO4
Q 11	Explain the working principle of a stepper motor and compare the different types (VR, PM, and hybrid). Describe the sequence of energising for single-winding and dual-winding excitation. Using an example, show how step angle is calculated. OR Design the full-step and half-step energising tables for a four-phase hybrid stepper motor. Explain how torque production varies in one-phase-on, two-phase-on, and micro-stepping modes. Provide a simulation/graph showing rotor position vs. time.	20	CO4