Continuous Assessment Test (CAT) – I - AUGUST 2025

Programme	:	B.Tech. Mechatronics and Automation	Semester	:	Fall 2025-26
Course Code & Course Title	:	BEEE214L & Electrical Machines and Drives	Class Number	:	CH2025260101764 CH2025260101761
Faculty	:	R. Gunabalan P. Sri Ramalakshmi	Slot	:	B1+TB1
Duration	:	1:30 Hrs	Max. Mark		50

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information
- Only non-programmable calculator without storage is permitted

Answer all questions

Q. No	Sub Sec.	Description	Marks	CO	BT Level
1	(a)	Identify the excitation system for the following motors and write the torque developed principle in each case. (a) DC Shunt motor (b) Synchronous motor (c) Reluctance motor (d) Induction motor (e) Transformer	5	1	K2
1	(b)	Write the analogy between electric and magnetic circuits	5	1	K2
2	(a)	A magnetic circuit is designed with ferromagnetic material having a relative permeability of 500. The cross-sectional area of the core is 10 cm^2, and the mean core length is 50 cm. The coil wound on the core has 200 turns carrying a current magnitude of 75 A. Calculate the magnetic flux in the core.	5	1	K3
2	(b)	The emf per turn for a single phase 4-kVA, 2200/220 V, 50 Hz transformer is approximately 5 V. Calculate i. The number of turns of primary and secondary ii. Current rating of primary and secondary iii. Transformation ratio iv. Flux in the core	5	1	K3

3	(a)	Why should a DC series motor not be started with no load conditions? Explain.	5	2	K2
3	(b)	Which speed control method is preferred for constant torque applications? Explain.	5	2	K2
4		The rating of the DC shunt motor available in a laboratory is 3.5 kW. The supply voltage is 220 V. The rated speed of the machine at no load is 1500 rpm and it draws a line current of 2.2 A. The rated current at full load condition is 17.6 A. Given R_a = 0.89 Ω; R_f = 180 Ω. Assume the field current remains constant. The rotational losses are 200 W. Determine (i) The no load armature current (ii) Power developed under full load (iii) Speed at full load (iv) Torque at full load (v) Efficiency of the motor at full load	10	2	K3
5	(a)	Explain the speed-torque characteristics of a DC motor which is used for constant speed applications with necessary motor equations and draw the speed-torque characteristics.	4	2	K2
5	(b)	A 250 V DC shunt motor has an armature resistance of 0.5 Ω and field resistance of 250 Ω. When driving a load of constant torque at 600 rpm, the armature current is 20 A. If it is desired to raise the speed from 600 rpm to 800 rpm, what resistance must be inserted in the shunt field circuit. Assume that the magnetic circuit is unsaturated.	6	2	K2