CBCS SCHEME

USN ☐☐☐☐☐☐☐☐☐☐ **BEE401**

Fourth Semester B.E/B.Tech. Degree Examination, June/July 2025

Electric Motors

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, choosing ONE full question from each module.***
2. M : Marks , L: Bloom's level , C: Course outcomes.

		Module – 1	**M**	**L**	**C**
1	a.	What is back emf? Derive the armature torque of a DC motor.	**6**	**L1**	**CO1**
	b.	Sketch the speed v/s I_a and torque v/s I_a characteristic of DC : i) Shunt motor ii) Series motor iii) Cumulatively compounded motor iv) Differentially compound motor.	**6**	**L2**	**CO1**
	c.	What are the losses that occur in DC machines? Draw the power flow diagram of DC motor.	**8**	**L2**	**CO1**
		OR			
2	a.	Explain the operation of four point starter with neat diagram, mention its advantage.	**6**	**L1**	**CO1**
	b.	Explain the fields test on series motor and explain the method to find out efficiency.	**6**	**L2**	**CO1**
	c.	A series motor having resistance of 1Ω between its terminals drives a fan, the torque of which is proportional to the square of the speed. At 230V its speed is 300 rpm and takes 15A. The speed of the fan is to be raised to 375 rpm by supply voltage control estimates the supply voltage required.	**8**	**L3**	**CO1**
		Module – 2			
3	a.	With the help of neat diagram, explain how efficiency of DC motor can be determined by the retardation test.	**10**	**L1**	**CO2**
	b.	A test on two coupled similar tram way motors with their field connected in series gave following results when one machine acted as a motor and the other as a generator, calculate the efficiency of motor and generator. Motor : Armature voltage : 590V, armature current : 56A voltage drop across field winding : 40V Generator : Armature voltage : 400V, Armature current : 44A, Field winding drop : 40V, resistance of each armature : 0.3Ω 10M.	**10**	**L2**	**CO2**
		OR			
4	a.	What is slip in induction motor? Explain its significance.	**4**	**L1**	**CO2**
	b.	A 12 pole, 50 Hz, 3ϕ IM has rotor resistance of 0.15Ω and stand still reactance of 0.25 PS phase. On full load it is running at a speed of 480 rpm. The rotor induced emf per phase at stand still is observed to be 32V. calculate : i) Starting torque ii) Fill load torque iii) Maximum torque iv) Speed at maximum torque.	**8**	**L2**	**CO2**
	c.	Explain and derive the torque equation for 3-ϕ induction motor and derive the condition for maximum torque.	**8**	**L2**	**CO2**

Module – 3					
5	a.	Starting from the fundamentals develop the equivalent circuit of a polyphase induction motor and explain the mechanical power developed is taken care of in equivalent circuit.	**10**	**L1**	**CO4**
	b.	Explain no load test and blocked rotor test in a 3-ϕ induction motor. How are the parameters of equivalent circuit electro mined from test results?	**10**	**L2**	**CO3**
OR					
6	a.	What is the purpose of using deep bar rotor? Explain the construction and working of deep bar rotor induction motor.	**10**	**L1**	**CO3**
	b.	A 415V, 29.84KW, 50Hz delta connected motor gave the following test data : No load test : 415V, 21A, 1250W Blocked rotor test : 100V, 45A, 2730W Construct the circle diagram and determine : i) Line current and power factor for rated output. ii) The maximum torque. Assume stator and rotor copper losses arc equal at stand still.	**10**	**L2**	**CO4**
Module – 4					
7	a.	Explain in detail auto transformer method of starting a squirrel Cage induction motor.	**10**	**L2**	**CO6**
	b.	Mention the different methods of speed control of 3-ϕ induction motor. Describe any two methods.	**10**	**L2**	**CO5**
OR					
8	a.	Explain double field revolving theory as applied to 1-ϕ phase induction motor and prove that it cannot produce any starting torque.	**10**	**L1**	**CO4**
	b.	Explain why 1 - ϕ induction motor is not self starting.	**5**	**L2**	**CO5**
	c.	Briefly explain torque speed characteristics of capacitor split phase motor. Mention the applications of capacitor split phase motors.	**5**	**L2**	**CO5**
Module – 5					
9	a.	What are v and inverted v curves? Sketch them and explain their significance.	**10**	**L2**	**CO6**
	b.	Explain the operation of synchronous motor at constant load variable excitation.	**10**	**L2**	**CO6**
OR					
10	a.	Explain the principle of operation of linear induction motor. List the some applications of it brief the working of linear conduction motor.	**10**	**L2**	**CO6**
	b.	State the methods of starting synchronous motor. Explain any one details.	**5**	**L2**	**CO6**
	c.	Explain the importance of daraping winding in synchronous motor.	**5**	**L1**	**CO6**

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