

CBCS SCHEME

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BEE401

Fourth Semester B.E./B.Tech. Degree Examination, June/July 2026 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
	a.	What is meant by Back emf? Explain its significance.		6	L1	CO1
	b.	Derive the torque equation of a DC motor.		6	L3	CO1
	c.	A DC motor takes an armature current of 110 A at 480 V. The armature circuit resistance is 0.2 ohms. The machine has 6 poles and the armature is lap connected with 864 conductors. The flux per pole is 0.05 wb. Calculate, (i) The speed (ii) The torque developed by the armature.		8	L3	CO1
OR						
Q.2	a.	Explain the characteristics of DC shunt motors.		6	L2	CO1
	b.	With neat diagram, explain the Swineburne's test on a DC motor. Mention the demerits of this test.		8	L3	CO1
	c.	Explain the power flow diagram with losses in DC motors.		6	L3	CO1
Module – 2						
Q.3	a.	Derive torque equation for a 3 ϕ Induction motor and derive condition for maximum torque.		8	L3	CO2
	b.	Sketch and explain the typical torque-slip characteristics of a 3 phase IM. (Three phase Induction Motor)		6	L3	CO2
	c.	The power input to the rotor of 440 V, 50 Hz, 6 pole, 3 ϕ Induction motor is 80 kW, the rotor EMF is observed to make 100 complete alternations per minute. Calculate (i) The slip (ii) The rotor speed (iii) The mechanical power developed.		6	L3	CO2

OR

Q.4	a.	Define slip of a three phase IM and explain the effect of slip on rotor parameters.	10	L1	CO2
	b.	A 400 V, 4 pole, 3 ϕ , 50 Hz star connected Induction Motor and reactance has a rotor resistance per phase equal to 0.01 Ω and 0.1 Ω respectively. Determine (i) Starting torque (ii) Slip at which maximum torque will occur. (iii) Speed at which maximum torque will occur (iv) Maximum torque (v) Full load torque if full load slip is 4%. Assume ratio of stator to rotor turns as 4.	10	L3	CO2

Module – 3

Q.5	a.	Draw and explain the phasor diagram of a 3 ϕ Induction motor under loaded condition.	6	L2	CO3
	b.	Explain with a neat circuit diagram, the construction and operation of a double cage induction motor, draw the equivalent circuit and speed torque characteristics.	8	L3	CO3
	c.	Briefly explain the various losses occurring in a 3 ϕ induction motor.	6	L3	CO3

OR

Q.6	a.	Explain No Load Test and Blocked Rotor Test in a 3 ϕ Induction Motor.	6	L3	CO3
	b.	Derive the approximate equivalent circuit referred to stator of an Induction Motor.	8	L3	CO3
	c.	Explain the phenomenon of logging and crawling in a 3 ϕ Induction Motor.	6	L3	CO3

Module – 4

Q.7	a.	What is the necessity of starter for a 3 ϕ Induction Motor? With a neat diagram, explain the operation of a Star-Delta starter.	10	L1	CO4
	b.	Enumerate the speed control methods of a 3 ϕ IM and explain any two methods in detail.	10	L1	CO4

OR

Q.8	a.	Explain the double field revolving theory as applied to a single phase Induction Motor and prove that it cannot produce any starting torque.	10	L3	CO4
	b.	With a schematic connection diagram, explain the construction, working and applications of capacitor start 1 ϕ Induction Motor.	10	L2	CO4

Module – 5

Q.9	a.	With a neat diagram, explain the principle of operation of a 3 ϕ synchronous motor.	6	L2	CO5
	b.	Explain the principle of operation of a linear induction motor. Draw its characteristics for various control voltages.	6	L2	CO5
	c.	Briefly explain the V and Inverted V curve of a synchronous motors and the methods of obtaining them.	8	L2	CO5
OR					
Q.10	a.	Explain the construction working characteristics and applications of a.c. servomotor.	8	L2	CO5
	b.	Describe a phenomenon of hunting in synchronous machine and methods to overcome this.	6	L3	CO6
	c.	What is a synchronous condenser? What are its applications?	6	L3	CO6
