CBCS SCHEME

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BEE401

Fourth Semester B.E./B.Tech. Degree Examination, Dec.2024/Jan.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
Q.1	a.	Derive an expression for the torque of a DC motor.	08	L1	CO1
	b.	Explain the concept of back emf and its significance.	06	L1	CO1
	c.	A 4 pole, 250 V, DC series motor has a wave connected armature with 200 conductors. The flux per pole is 25 mWb when motor is drawing 60 A from the supply. Armature resistance is 0.15 Ω while series field winding resistance is 0.2 Ω. Calculate the speed under this condition.	06	L2	CO1
		OR			
Q.2	a.	Draw and explain the characteristics of DC shunt and series motor.	08	L1	CO1
	b.	Explain the different methods of controlling speed of a DC shunt motor.	06	L1	CO1
	c.	Derive the condition for maximum efficiency of a DC machine.	06	L2	CO1
		Module – 2			
Q.3	a.	Explain with suitable sketches the construction of squirrel cage and slip ring induction rotor. State the merits and demerits of each type.	08	L1	CO2
	b.	A 3 phase, 400 V, 50 Hz, 4 pole induction motor has star connected stator winding. The rotor resistance and reactance are 0.1 Ω and 1 Ω respectively. The full load speed is 1440 rpm. Find the torque developed on full load by the motor. Assume stator to rotor ratio as 2 : 1.	08	L2	CO2
	c.	Derive Torque equation for 3ϕ induction motor.	04	L2	CO2
		OR			
Q.4	a.	Discuss the complete torque-slip characteristics of a 3ϕ induction motor including motoring, generating and braking regions.	08	L1	CO2
	b.	A 3-phase induction motor having 6-poles. Stator winding is star connected runs on 240 V, 50 Hz supply. The rotor resistance and stand still reactance are 0.12 Ω and 0.85 Ω per phase. The ratio of stator to rotor turns is 1.8 and full load slip is 4%. Find the developed torque at full load, maximum torque and the speed at maximum torque.	08	L2	CO2
	c.	How to change the direction of rotating magnetic field?	04	L1	CO2

		Module – 3			
Q.5	**a.**	Describe the constructional features of a double cage and deep bar rotors of 3ϕ induction motors and explain its operation.	**10**	**L1**	**CO3**
	b.	Starting from the fundamentals develop the equivalence circuit of a polyphase induction motor and explain how mechanical power developed is taken care of in the equivalence circuit.	**10**	**L1**	**CO3**
		OR			
Q.6	**a.**	Explain the phenomenon of logging and crawling in a 3ϕ induction motor.	**10**	**L1**	**CO3**
	b.	Discuss the procedure for no load test and blocked rotor test on a 3ϕ induction motor. How are the parameters of equivalent circuit determined from test results?	**10**	**L2**	**CO3**
		Module – 4			
Q.7	**a.**	Explain the Direct on line starter of 3ϕ induction motor with a suitable circuit diagram.	**10**	**L1**	**CO4**
	b.	Enumerate the speed control methods of 3ϕ induction motor and explain supply frequency control method.	**10**	**L2**	**CO4**
		OR			
Q.8	**a.**	With schematic connection diagram and phasor diagram, explain the construction, working and application of a capacitor start induction motor.	**10**	**L1**	**CO4**
	b.	Explain double field revolving theory as applied to a single phase induction motor.	**10**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain briefly about the construction and working principle of a synchronous motor.	**10**	**L2**	**CO5**
	b.	Write a note on V-curves and inverted V-curves of a synchronous motor.	**10**	**L2**	**CO5**
		OR			
Q.10	**a.**	Explain the working, characteristics and applications of Universal motor.	**10**	**L2**	**CO5**
	b.	Explain the principle of operation of linear induction motor.	**10**	**L2**	**CO5**

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