CBCS SCHEME

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BEE401

Fourth Semester B.E./B.Tech Degree Examination, June/July 2024
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.	What is back emf? Explain the significance of back emf in DC motor.	7	L1	CO1
	b.	Explain the different characteristics of DC shunt motor.	6	L2	CO1
	c.	A 230V DC shunt motor runs at 800rpm and takes current of 50A. Find the resistance to be added to the field circuit on increase the speed from 800rpm to 1000rpm at an armature current of 80A. Assume flux is proportional to field current. Armature resistance is 0.15Ω and field resistance is 250Ω.	7	L3	CO1
		OR			
Q.2	a.	Explain the various losses that occur in DC machine. Derive the condition for maximum efficiency of DC motor.	10	L1	CO1
	b.	With a neat diagram, explain the Swimburn's test on a DC motor mention the demerits of this test.	10	L1	CO1
		Module – 2			
Q.3	a.	Explain with help of suitable diagram how rotating magnetic field is produced in a 3 phase induction motor.	6	L1	CO2
	b.	Explain the construction and working of 3-phase induction motor.	8	L2	CO2
	c.	Derive the equation for torque developed by the 3-phase induction motor.	6	L3	CO2
		OR			
Q.4	a.	Discuss the torque-slip characteristics of a 3ϕ I.m including motoring generating and braking regions.	10	L2	CO2
	b.	A 400V, 3ϕ, 50Hz star connected I.m has a rotor resistance and reactance per phase equal to 0.01Ω and 0.1Ω respectively. determine : i) Starting torque ii) Slip at which maxm torque will occurs iii) Speed at which maxm torque will occur iv) Maximum torque v) Full load torque. If full load slip is 4%, assume ratio of stator to rotor tunes as 4.	10	L3	CO2
		Module – 3			
Q.5	a.	Starting from the fundamentals, draw and explain the equivalent circuit diagram of 30ϕ I m.	10	L2	CO3
	b.	Discuss the losses in 3-phase I.m.	10	L2	CO3
		OR			
Q.6	a.	Explain the phenomenon of cogging and crawling in a 3-phase induction motor.	8	L2	CO3
	b.	Explain the construction and working of double cage I.m.	6	L2	CO3
	c.	Write short notes on induction generator.	6	L2	CO3

		Module – 4			
Q.7	**a.**	Justify the necessity of starter for 3ϕ I.m. Explain star – delta starter with neat sketch.	**8**	**L2**	**CO4**
	b.	With a neat diagram, explain the speed control of a 3-ϕ induction motor using V/f control.	**6**	**L2**	**CO4**
	c.	A squired cage I.m has a full load slip of 4% and blocked rotor current of 6 times the full load current. Find the percentage of tapping of the auto-transference starter to give full load torque on starting and the line current as a percentage of full load current.	**6**	**L3**	**CO4**
		OR			
Q.8	**a.**	Explain double revolving theory as applied to a 1-ϕ induction motor and prove that it cannot produce any starting torque.	**6**	**L2**	**CO4**
	b.	A 250 watt. 230V, 50Hz single phase capacitor start I.m has the following constants for the main and auxiliary windings main winding $Z_m = (4.5 + j3.7)\Omega$, auxiliary winding $Z_a = (9.5 + j3.5)\Omega$. Determine the value of the capacitor that will place the main and auxiliary winding currents in quadrature at starting.	**8**	**L4**	**CO4**
	c.	With a neat sketch, explain the construction working and applications of shaded pole I.m.	**6**	**L2**	**CO4**
		Module – 5			
Q.9	**a.**	Explain the principle of operation of synchronous motor at constant load variable excitation.	**8**	**L2**	**CO5**
	b.	With a neat sketch, explain V and inverted V curves of synchronous motor.	**6**	**L3**	**CO5**
	c.	What is a synchronous condenser and its uses.	**6**	**L2**	**CO5**
		OR			
Q.10	**a.**	With a neat sketch, explain the construction and working of universal motor.	**8**	**L2**	**CO5**
	b.	With a neat sketch, explain the construction and working of linear induction motor.	**6**	**L2**	**CO5**
	c.	With a neat diagram, explain the construction and working of switched reluctance motor.	**6**	**L2**	**CO5**

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