Model Question Paper-1 with effect from 2019-20 (CBCS Scheme)

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Fourth Semester B.E. Degree Examination

Subject: Electric Motors (18EE44)

Time: 03 Hours **Max. Marks: 100**

Note: 01. Answer any **FIVE** full questions, choosing at least **ONE** question from each **MODULE**

		Module - 1	***Bloom's Taxonomy Level**	**Marks**
Q.01	a	Derive the torque equation of DC Motor and briefly explain the various types of torque in a DC Motor	L2, L3 CO1, PO1	8M
	b	With a neat circuit diagram explain the operation of 3-Point starter and mention its disadvantage	L2, L3 CO1, PO1, PO2	6M
	c	A 220V shunt motor has an armature resistance of 0.2Ω and field resistance of 110Ω. The motor draws 5A at 1500rpm at no load. Calculate the speed and the shaft torque if the motor draws 52A at rated voltage	L3 CO2, PO2	6M
		OR		
Q.02	a	A 230V DC Shunt motor with an armature resistance of 0.4Ω is excited to give constant main field. The motor runs at 500rpm at full load and takes an armature current of 30A. If resistance 1.1Ω is placed in armature circuit, find the speed of motor at (i) Full load torque (ii) 1.5 times full load torque	L3 CO2, PO2	8M
	b	Explain the various types of losses in a DC Motor	L2 CO3, PO1	6M
	c	Draw and explain the power flow diagram of DC machine working as a DC Motor	L2, L3 CO3, PO1	6M
		Module - 2		
Q.03	a	With a neat circuit diagram explain the Hopkinson's test conducted on two identical DC shunt machines and how the efficiency of the machine running as a motor and generator are determined?	L2, L3 CO3, PO1, PO2	8M
	b	A field test on two mechanically coupled similar motors with their fields connected in series and with one machine running as motor and the other as a generator gave the following data: Motor: Armature current: 40A, Armature voltage: 200V, drop across its field winding is 15V Generator: Armature current: 32A, Armature voltage: 160V, drop across its field winding is 25V The resistance of each armature is 0.4Ω. Calculate the efficiency of each machine at this load	L3 CO3, PO2	6M
	c	With a neat circuit diagram explain the brake test conducted on DC shunt motor and explain how the efficiency is determined	L2, L3 CO3, PO1, PO2	6M

		OR		
Q.04	a	Derive the torque equation of a 3 phase induction motor. Also derive the condition at which torque developed by the motor is maximum and expression for maximum torque	L2, L3 CO1, PO1	8M
	b	Define slip of a 3 phase induction motors and explain the effect of slip on rotor parameters	L2, L3 CO2, PO1	6M
	c	A 3 phase induction motor having star connected rotor has an induced EMF of 80V between slip rings at standstill on open circuit. The rotor has a resistance and reactance per phase of 1Ω & 4Ω respectively. Calculate current / Phase & power factor when (a) Slip rings are short circuited (b) Slip rings are connected to a star connected rheostat of 3Ω per phase	L3 CO2, PO2	6M
		Module - 3		
Q.05	a	From the basics draw and explain the exact equivalent circuit diagram of a 3 Phase induction motor	L2, L3 CO2, PO1	6M
	b	Explain the operation of grid connected induction generator	L2 CO2, PO1	4M
	c	Draw the circle diagram for a 3 phase, 50 Hz, 20 HP star connected induction motor with the following data: No load test: 400V, 9A, 0.2 pf lag;Blocked rotor test: 200V, 50A, 0.4 pf lag Determine the line current, power factor, efficiency and slip for full load condition	L2, L3, L4 CO2, PO2,PO4	10M
		OR		
Q.06	a	Explain the operation of double cage rotor induction motor along with the equivalent circuit diagram and also draw its torque slip characteristics	L2 CO2, PO1	8M
	b	With a neat circuit diagram explain the no load & blocked rotor test conducted on a 3 phase induction motor and show how the equivalent circuit diagram parameters are calculated	L2, L3 CO3, PO1, PO2	6M
	c	Explain the operation of self & externally excited induction generator	L2 CO2, PO1	6M
		Module - 4		
Q.07	a	Explain the necessity of a starter to start 3 phase induction motor and with a neat circuit diagram explain the operation of star delta starter	L2, L3 CO4, PO1, PO2	8M
	b	List down the various methods employed for the speed control of a 3 phase induction motor and explain the rotor resistance method of speed control with a neat circuit diagram	L2, L3 CO4, PO1	6M
	c	With a neat diagram explain the constructional features and operation of shaded pole type induction motor	L2 CO1, PO1	6M
		OR		
Q.08	a	Explain the concept of double field revolving theory in a single phase IM to show that the they are not self-starting	L2, L3 CO1, PO1, PO2	8M
	b	Using frequency control explain how the speed control of a 3 phase induction motor is achieved	L2, L3 CO4, PO1, PO2	6M
	c	With a neat diagram explain the constructional features and operation of split phase induction motor	L2 CO1, PO1	6M

Module - 5				
Q.09	a	Why synchronous motors are not self starting and explain the various techniques employed to start the synchronous motors	L2, L3 CO5, PO1	8M
	b	Briefly explain the hunting in a synchronous motors and how do you reduce the effect of hunting	L2 CO5, PO1	6M
	c	With a neat diagram explain the constructional features and operation of universal motor	L2 CO1, PO1	6M
OR				
Q.10	a	With a neat diagram explain the constructional features and operation of AC servo motor	L2 CO1, PO1	8M
	b	With the help of a phasor diagram explain the operation of synchronous motor subjected to variable excitation	L2, L3 CO5, PO1	6M
	c	With a neat diagram explain the constructional features and operation of stepper motor	L2 CO1, PO1	6M