Bachelor of Electrical Engineering (Evening) Examination, 2018

(4thYear, 1stSemester)

ELECTRICAL MACHINES - III

Time: Three Hours **Full Marks**: 100

(50 marks for each part)
Use a separate Answer-Script for each Part

PART - I

Answer any three questions

Two marks are for neatness and well-organised answer

1.	a) Using double-revolving field theory, explain why a single-phase induction motor is not self-starting.	8
	b) Classify single-phase induction motors in accordance with the methods of starting. Discuss the capacitor split-phase type of motor with circuit diagram, phasor diagram at starting and typical torque-speed characteristic.	8
2.	a) Discuss in detail the procedure for determining the parameters of equivalent circuit of a single-phase induction motor.	8
	b) A 220 volt, single-phase induction motor gave the following test results: Blocked-rotor test : 120 Volt, 9.6 Ampere, 460 Watt No-load test : 220 Volt, 4.6 Ampere, 125 Watt The stator winding resistance is 1.5 Ω, and during the blocked-rotor test, the starting winding is open. Determine the equivalent circuit parameters. Also find the core, friction and windage losses.	8
3.	What is resistance split-phase motor? For a resistance split phase motor, draw the phasor diagram and find the value of resistance for getting i) maximum starting torque, and ii) maximum torque per ampere.	16
4.	a) Explain the operation of dc series motor when connected to an ac source. What measures may be adopted to improve the performance of dc series motor when fed with ac?	8

	b) Draw and explain the phasor diagram of a single phase series motor.	8
5.	Write short notes on i) Equivalent circuit of a single-phase induction motor ii) Construction and principle of operation of Shaded pole motor	8+8

PART-II.

Answer *any three* questions from this part.
Two marks are reserved for neat and well organised answer

6. Justify the following (any four) 4X4

a) O C C of an alternator can shift with speed but S C C remains almost fixed with operating speed.

b) Slip test is not performed at rated voltage.

c) Hydro alternators run at low speed.

d) Zero power factor characteristics (ZPFC) of an alternator does not start from origin.

e) Alternators have demagnetizing armature reaction under lagging load.

f) A turbo alternator is designed with small value of D/L ratio compared to hydro alternator of same rating

7.	a) Draw the phasor diagram for a cylindrical rotor alternator both with lagging and leading loads. Also show the position of MMF phasors in the diagram.	8
	b) A 6.6kV 3-phase 50 Hz star connected alternator gave the following test data: OC Test: I_f=3.5 A, Armature Voltage (E_0) = 6.6 KV SC Test: : I_f = 1.0 A, Armature Current (Ia)=500A If per phase armature resistance, ra =0.5 Ω, calculate the voltage regulation at a load current of 300 A at 0.8 p.f. lagging. (Assume linear magnetic circuit)	*8*
8.	a) Develop the power angle characteristics of a salient pole alternator. Also sketch the same showing maximum power.	8
	b) What do you understand by "Cylindrical Rotor Theory"? Why 'Cylindrical Rotor Theory' is not applicable for salient pole machines?	8
9	a) With the help of phasor diagram discuss the operation of a synchronous condenser. Also	8

	indicate the application areas for the same.	
	b) A 10 MVA 3-phase star connected 11kV, 50 Hz synchronous motor has reactance of X_d=2 Ω and X_q= 1.8 Ω. At full load, unity power factor and rated voltage, compute its excitation voltage.	8
10	Write short notes on any Two:	8 + 8
	a) Starting techniques of synchronous motor. b) MMF method for calculation of voltage regulation. c) V- curve of a synchronous machine.	