BACHELOR OF ENGINEERING IN ELECTRICAL ENGINEERING (EVENING) EXAMINATION, 2018

(4^{th} Year, 1st Semester, Supplementary)

ELECTRICAL MACHINES - III

Time : Three hours | Full Marks : 100

(50 marks for each part)
(Use separate Answer Script for each part)

PART – I

Answer ANY THREE questions.
Two marks are for well-organized answer.

1.	In a single-phase commutatator machines, discuss the emfs that are induced in the short circuited oil undergoing commutation. Explain how commutation in single-phase series machines differs from in DC machines.	16
2. (a)	Explain the operation of a DC series motor when connected to an AC source.	6
	Draw and explain the phasor diagram of a single-phase series motor.	10
3.	What is compensated single-phase series motor? Show with the help of phasor diagram that a compensated series motor possesses better speed-torque characteristics, better power factor operation and improved commutation as compared to an uncompensated series motor.	16
4. (a)	Explain the construction and principle of operation of a repulsion motor.	10
(b)	Show that it is favourable to start a repulsion motor from its low-impedance position.	6
5.(a)	With the help of double revolving field theory explain the working of a single phase induction motor and show that single phase induction motor is not self-starting. What are the various methods of starting of single phase induction motor?	10
(b)	Describe the construction and working principle of shaded pole motor.	6

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) EMF method to determine voltage regulation of an alternator is pessimistic.

b) A cylindrical rotor synchronous machine has higher speed compared to a salient pole synchronous machine of similar rating.

c) Liquid hydrogen is used as cooling medium for large alternator armature windings.

d) It is not mandatory to laminate the rotor of a synchronous machine, but the rotor of a salient pole machine is always laminated.

e) Open Circuit Characteristics (OCC) of an alternator is non-linear.

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 10 MVA, 6.6kV 3-phase 50 Hz star connected alternator gave the following test data: 8

OC Test: I_f=3.5 A, Armature Voltage (E_0) = rated

SC Test: : I_f = 1.0 A, Armature Current (Ia)=rated

If per phase armature resistance, ra =0.4 Ω, calculate the voltage regulation at half load and 0.8 p.f. lagging. (Assume linear magnetic circuit)

8. a) Develop the power angle characteristics of a cylindrical rotor alternator. Also sketch the same showing maximum power. 8

b) What do you understand by "Cylindrical Rotor Theory"? Explain 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 indicate the application areas for the same. 8

	b) A 5 MVA, 3-phase star connected, 50 Hz, 6.6kV salient pole synchronous motor has reactances of X_d=1.8 Ω and X_q= 1.5 Ω. If the machine is operating at rated conditions at 0.8 power factor lag, compute its excitation voltage.	8
10	Write short notes on any Two: a) Starting techniques of synchronous motor. b) Operating Chart of an Alternator. c) V- curve of a synchronous machine.	8 + 8