CS/B.Tech/(EE-New)/SEM-5/EE-501/2013-14

2013

ELECTRICAL MACHINES – II

Time Allotted : 3 Hours *Full Marks* : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1 Choose the correct alternatives for any *ten* of the following : $10 \times 1 = 10$

i) In a single phase induction motor

a) two rotating fields rotating at synchronous speed in opposite direction

b) two rotating fields rotating at synchronous speed in the same direction

c) one rotating field

d) none of these.

ii) In the resistance split phase motor,

a) the motor employs an auxiliary winding with R/X ratio higher than that of the main winding

b) the motor employs an auxiliary winding with R/X ratio lower than that of the main winding

c) the motor employs an auxiliary winding with R/X ratio equal to that of the main winding

d) the motor employs an auxiliary winding with R/X ratio which is none of the above.

iii) A compensating winding in a single-phase series motor

a) reduces reactance drop and improves commutation

b) reduces reactance only

c) reduces reactance drop but retards commutation

d) improves commutation only.

iv) A fractional-pitch winding is mainly used to reduce

a) amount of copper in the winding

b) size of the machine

c) harmonics in the generated *emf*

d) cost of the machine.

v) If the power factor of an alternator is zero lagging, the armature reaction is

a) demagnetizing

b) magnetizing

c) cross magnetizing

d) both demagnetizing and cross magnetizing.

vi) The synchronous-impedance method' of finding the voltage regulation by a cylindrical rotor alternator is generally considered as

a) a pessimistic method because saturation is not considered

b) an optimistic method because saturation is not considered

c) a fairly accurate method even if power factor is not taken into account while determining synchronous impedance

d) a fairly accurate method even if power factor is taken into account while determining synchronous impedance.

vii) A salient pole synchronous machine has maximum power output when power angle δ is

a) 90° b) either 90° or more

c) less than 90° d) more than 90°.

viii) A three-phase synchronous motor is operating
load at unity power factor. If the field current i
increased, the power factor and armature current

a) leading and the current will decrease

b) lagging and the current will increase

c) lagging and the current will decrease

d) leading and the current will increase.

ix) The *ac* tachometer is

a) nothing but a synchronous motor

b) nothing but a two-phase induction motor

c) nothing but a single-phase induction motor

d) none of these.

x) What type of motor is most suitable for a com
printer derive ?

a) Reluctance motor b) Hysteresis motor

c) Shaded pole motor d) Stepper motor.

xi) The motor generally used in a tape recorder is

a) universal motor b) reluctance motor

c) split-phase motor d) hysteresis motor.

xii) A compensated winding in an *ac* commutator motor

a) reduces reactance drop and improves commutation

b) reduces reactance drop

c) reduces reactance drop but retards commutation

d) improves commutation only.

GROUP – B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

2. Why the rotating field is not developed in a single-phase IM when the stator is provided with a single phase *ac* supply ?

3. Explain why cylindrical rotor alternators have small diameter & large core length while salient pole alternators have large diameter & small core length.

4. What is a synchronous condenser ? Explain its operation & utility with phasor diagram. 2 + 3

5. Briefly describe the 'one dark and two bright method' of alternator synchronization. Name one substitute of this method. 4 + 1

6. Explain the operating principle of a stepper motor.

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GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

7. a) Draw the equivalent circuit of a single phase induction motor during no load and blocked rotor condition with the help of double revolving field theory. 8

b) A 400 W, 230 V, 50 Hz capacitor starts single-phase induction motor has the following standstill constants for Main and Auxiliary winding :

Auxiliary winding : $Z_{aux} = 17 + j6\ \Omega$

Main winding : $Z_{main} = 8 + j6{\cdot}8$

Find the value of starting capacitance that will place the main and auxiliary winding current in quadrature at starting. 7

8. a) Explain two reaction theory for a salient pole synchronous machine. Using this theory, draw the phasor diagram for lagging current for a salient pole generator. 5

b) Explain conditions for parallel operation of alternators. 4

c) Describe Static or Brushless Method of excitation of an alternator. What is its advantage over *dc* exciters ? 4 + 2

9 a) Define regulation of a synchronous generator. Why is it important to know the value of regulation ? Can regulation be negative ? If yes, give example.

2 + 2 + 1 + 1

b) Describe briefly the principle of *emf* method of calculation of regulation. How is it experimentally determined in laboratory by conducting Open circuit and Short circuit tests and Unity power factor load ?

4 + 5

10. a) Show that compensated *ac* series motor possesses better torque speed characteristic, better power factor and better commutation than uncompensated *ac* series motor. 4 + 4 + 2

b) What are the modifications should be done in a *dc* series motor so that it will run satisfactorily with *ac* supply ? 5

11. Write short notes on any *three* of the following : 3 × 5

a) Switched Reluctance Motor

b) Brushless *dc* Motor

c) Synchronizing Power

d) Induction Generator

e) Linear Induction Motor.

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