Register Number……

B.E. DEGREE EXAMINATIONS: APRIL / MAY 2010

Fourth Semester

ELECTRICAL AND ELECTRONICS ENGINEERING

U07EE401: Electrical Machines – II

Time: Three Hours **Maximum Marks: 100**

Answer ALL the Questions:-

PART A (10 x 1 = 10 Marks)

1. Load angle of an Alternator is, angle between

A) X_L and X_a, B) Z and R_a C) I and V, D) E and V.

2. The method with which leakage reactance of an Alternator can be separated is,

A) EMF method, B) MMF method, C) ZPF method, D) Slip Test.

3. A synchronous motor operated at no-load with _____ condition, is called a synchronous condenser.

A) Normal excitation B) No-excitation C) Under excitation D) Over excitation.

4. In synchronous motor, power input P_i is maximum when,

A) $\delta = 180^o - \theta$ B) $\delta = 0^o$ C) $\delta = 90^o$ D) $\delta = \theta$.

5. What is the effect of change in supply voltage on the starting torque of a 3-phase induction motor?

A) $T_{ds} \propto V_{1S}$ B) $T_{ds} \propto R_1$ C) $T_{ds} \alpha V_{1S}^2$ D) $T_{ds} \alpha R_1^2$

6. Normal value of slip of an induction motor operating at full load is,

A) 1% B) More than 10% C) Less than 3% D) 3 – 5 %.

7. The effect of introducing resistance in the rotor circuit of a 3-phase induction motor at starting is,

A) decreases the starting torque, B) decreases the rotor emf,

C) increases the starting torque, D) increases the starting current.

8. Injecting a voltage in the rotor circuit of a 3-phase induction motor leads to the following range of speed variation:-

A) Sub-synchronous only, B) from sub-synchronous to super-synchronous,

C) Super-synchronous only, D) from sub-synchronous to synchronous speed.

9. The direction of rotation of a capacitor start 1-phase induction motor can be reversed by interchanging terminals of

A) Capacitor B) Supply C) Centrifugal switch D) Stating winding.

10. The resolution of a stepper motor is given by the equation,

A) $360^{o}/N_r$ B) No. of steps × step angle C) No. of steps/step angle D) $\frac{360^{\circ}.Nr}{f}$.

PART B (10 x 2 = 20 Marks)

11. Why almost all large size Synchronous machines are constructed with rotating field system type?
12. What is meant by armature reaction in alternators?
13. State the characteristics features of Synchronous motor.
14. What are V and inverted V-curves of Synchronous motor?
15. How frequency of the rotor current is related to the slip in an Induction motor?
16. What is the relation between copper loss in rotor, slip and power input to the rotor of 3-phase Induction motor?
17. List the different methods of speed control applicable to 3-phase squirrel-cage Induction motor.
18. What are the constructional requirement for 3-phase Induction motors in-order to make use of star-delta starter?
19. Why are centrifugal switches provided on many 1-phase Induction motors?
20. Name some applications of stepper motors.

PART C (5 x 14 = 70 Marks)

21. a) (i) Explain the phenomena of armature reaction in alternator for different load power-factors. (7)

(ii) A 3-phase, star-connected Alternator on open circuit is required to generate a line voltage of 3.4kV, 50Hz, when driven at 500rpm. The stator has 3 slots per pole per phase and 10 conductor per slot. The coils are short chorded by 1 slot. Calculate (i) the number of poles and (ii) the useful flux per pole. (7)

(OR)

b) (i) Derive an expression for the synchronizing torque of a 3-phase synchronous generator on no-load. (7)

(ii) Discuss two reaction theory with respect to synchronous generators. (7)

22. a) What is the principle of operation of synchronous motor? Describe briefly the different methods used for the starting of Synchronous motors.

(OR)

b) Explain V and inverted V-curves of a Synchronous motor. What is the significance of these curves?

23. a) (i) Derive the torque-slip equation for a 3-phase Induction motor and also the equation for slip at which maximum torque occurs. (7)

(ii) The power input to the rotor of a 415V, 50Hz, 4-pole, 3-phase Induction motor is 55kW. The frequency of rotor induced emf is 2Hz. Find (i) the slip (ii) rotor speed (iii) rotor copper loss and (iv) mechanical power developed. (7)

(OR)

b) Explain the experimental procedure of no load and blocked rotor tests on induction motors. Give the procedure of constructing a circle diagram.

24. a) With the help of a neat diagram, describe the working of an Autotransformer starter. Compare this starter with a stator resistance starter.

(OR)

b) What is slip power? Explain slip power recovery scheme with respect to induction machines.

25. a) Explain the equivalent circuit of 1-phase induction motor and state how the performance is analyzed with the help of equivalent circuit.

(OR)

b) (i) Explain the construction and working of shaded pole induction motor, with neat diagram. (7)

(ii) Explain the working of any one type of stepper motor. (7)

****