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VASAVI COLLEGE OF ENGINEERING *(Autonomous)*, HYDERABAD

B.E. (CBCS: EEE) IV-Semester Main Examinations, May-2018

Electrical Machinery-II

Time: 3 hours — Max. Marks: 70

Note: Answer ALL questions in Part-A and any FIVE from Part-B

Part-A (10 × 2 = 20 Marks)

1. Distinguish between squirrel cage and slip ring rotors in three phase induction motors.
2. Derive the relation between Maximum torque and full load torque for three phase induction motors in terms of slip, per phase rotor resistance and reactance.
3. Why locus of rotor current of three phase induction motor is a circle?
4. What happens if only frequency is changed in the speed control of three phase induction motor?
5. Write advantages of fractional pitch winding.
6. Why slip test could not be conducted on wound rotor alternator?
7. Draw power angle characteristic for active power for wound rotor alternator.
8. Define synchronizing power coefficient.
9. Why a single phase induction motor is not a self-starting motor?
10. A 1-ϕ, 4 pole, 50 Hz induction motor is running at 1440 r.p.m in the direction of forward rotating magnetic field. Find its slip corresponding to backward rotating magnetic field.

Part-B (5 × 10 = 50 Marks)

11. a) Explain the principle of production of rotating magnetic field in a 3-phase induction motor. [5]

    b) An 8-pole, 50Hz, 3-phase slip ring induction motor has effective resistance of 0.08 Ω/phase. The speed corresponding to maximum torque is 650 rpm. What is the value of resistance to be inserted in rotor circuit to obtain maximum torque at starting? [5]

12. a) Explain the procedure to construct circle diagram using No-load and Blocked rotor tests results. [6]

    b) A three phase squirrel cage induction motor has a short-circuit current of 5 times the full-load current. Its full-load slip is 5%. Calculate the starting torque as a percentage of full-load torque if the motor is started by i) DOL starter ii) Star Delta Starter. [4]

13. a) Derive EMF equation of a three phase alternator [3]

    b) Open Circuit and Short Circuit and ZPF tests were performed on a 3-phase, 5000kVA, 6.6kV and star- connected alternator. The results are given below. [7]

I_f, A	V_{oc}, V	V_{ZPF}, V
32	3100	0
50	4900	1850
75	6600	4250
100	7500	5800
140	8300	7000

S.C: I_f = 32A, I_{sc} = 438A R_{aph} = 0.8 ohms. Calculate the percentage regulation for full load condition at 0.8pf leading using ZPF method.

Contd....2

14. a) Derive the equations for per-phase real and reactive powers drawn by a synchronous motor using its equivalent circuit. [4]

b) The line current drawn by a 11 kV, 3-ϕ star connected synchronous motor is 60A. The effective resistance and synchronous reactance per phase are respectively 1 Ω and 30Ω. Find the power supplied to the motor, and the induced electromotive force for a power factor of 0.8 i) lagging ii) leading. [6]

15. a) Explain double revolving field theory. [6]

b) The impedances of main winding and auxiliary windings of a 1-ϕ induction motor are 2 + j20 Ω and 4+ j1 Ω respectively. Find the value of capacitance required to place in series with the auxiliary winding so as to make the phase angle between main winding and auxiliary winding equal to 90°. [4]

16. a) Derive the torque equation of induction motor by considering rotor equivalent circuit alone. [3]

b) The impedances at standstill of the inner and outer windings of a double cage rotor are (0.01+j0.5) ohms and (0.05+j0.1) ohms respectively. Calculate the ratio of torques due to the two winding (i) at starting (ii) when running with a slip of 5 %. [7]

17. Answer any ***two*** of the following:

a) A synchronous motor is drawing power from an infinite bus. Discuss the effect of changing excitation at a constant load with the help of phasor diagram [5]

b) Why synchronous motor is not self starting? Explain various starting methods. [5]

c) List different types of single phase induction motors. Also mention their applications. [5]