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Question Paper Code : 20513

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2022.

Fourth Semester

Electrical and Electronics Engineering

EE 8401 – ELECTRICAL MACHINES – II

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Distinguish between concentrated and distributed three-phase winding used in AC machines.

2. State the conditions necessary for paralleling the alternators.

3. Compare the salient features of synchronous motor with induction motor.

4. Why synchronous motor is not a self-start motor? State any two starting methods.

5. Compare Squirrel cage and Slip-ring induction motors with respect to construction and performance.

6. If the frequency of the supply voltage to the stator is 50 Hz while the frequency of the induced emf in the rotor is observed to be 90 cycles per min. Calculate the slip and speed of the motor, assuming that the stator is wound for 6-poles.

7. List the various methods of speed control by changing slip applicable to :

   (a) both cage and slip ring motors and

   (b) exclusively for slip ring motors

8. We can bring an induction motor to a quick stop either by plugging it or by exciting the stator from a DC source. Which method produces the least amount of heat in the motor? Justify.

9. Draw the equivalent circuit for single phase induction motor at running Condition.

10. Define magnetic levitation.

PART B — (5 × 13 = 65 marks)

11. (a) Explain with suitable diagram, the process of synchronizing Alternator with infinite bus bar and determining its voltage regulation. (13)

Or

(b) Explain the ampere-turn method of predetermining the voltage regulation of an alternator. (13)

12. (a) Explain the laboratory method of obtaining V and inverted V-curves of the synchronous motor. (13)

Or

(b) Explain the role of damper winding in Synchronous Machines. Also draw load angle versus time during hunting with and without damper windings. (13)

13. (a) Derive an expression for the torque developed in three-phase induction motor. Sketch the torque-slip characteristic and mark the starting torque, maximum torque and operating region. Also state how do starting and maximum torques vary with the rotor resistance? (13)

Or

(b) A three-phase Induction motor is excited with sinusoidal currents. Explain how a Rotating Magnetic Field is produced and justify the rotor will rotate in the direction of RMF with neat sketches. (13)

14. (a) Explain with a neat sketch, the construction and working of an Auto-transformer starter. (13)

Or

(b) Explain in detail the speed control of three phase induction motor by pole changing method. (13)

15. (a) Explain the construction and working of (i) Resistance split-phase induction motor and (ii) capacitor start induction motor. (13)

Or

(b) Explain with a neat diagram and characteristics the operation of universal motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A 400 V, three-phase, star-connected induction motor gave the following test results: (15)

No-load: 400 V, 8.5 A, 1100 W

Blocked-rotor: 180 V, 45 A, 5700 W

Determine the ohmic values of the components in the circuit model and calculate the line current and power factor when the motor is operating at 5% slip. The stator resistance per phase is 0.5 Ω and the standstill leakage reactance of the rotor winding referred to the stator is equal to that of the stator winding.

Or

(b) A 3.5 MVA, slow-speed, 3-phase synchronous generator rated at 6.6 kV has 32 poles. Its direct and quadrature-axis synchronous reactances as measured by the slip test are 9.6 Ω and 6 Ω respectively. Neglecting armature resistance, determine the regulation and the excitation emf needed to maintain 6.6 kV at the terminals when supplying a load of 2.5 MW at 0.8 pf lagging. What maximum power can the generator supply at the rated terminal voltage, if the field becomes open-circuited? (15)