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Question Paper Code : 50533

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2023.

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. What are the conditions required for parallel operation of alternators?

2. Define regulation.

3. What is the role of damper winding?

4. Why synchronous motor is not self-starting?

5. Compare squirrel cage and slip ring induction motor.

6. Write the condition for getting maximum torque from a three phase induction motor.

7. What are the speed control methods of three phase induction motor?

8. What is the need for starters for a three phase induction motor?

9. What are the applications of shaded pole induction motor?

10. Why single phase induction motor is not a self-starting?

PART B — (5 × 13 = 65 marks)

11. (a) In a 2000 V. single-phase synchronous generator, a full-load current of 100 A is produced on short-circuit by a field excitation of 2.5 A; an emf of 500 V is produced on open-circuit by the same excitation. The armature resistance is 0.8 Ω. Determine the voltage regulation when the generator is delivering a current of 100 A at (13)

(i) unity power factor,

(ii) 0.71 power factor lagging; and

(iii) 0.8 power factor leading. (4+5+4)

Or

(b) The no-load test performed on a 1000 kVA, 3000 V, 50Hz, three-phase star connected alternator gave the following readings:

I_f (A)	15	30	50	75	90	120	150
V/ph (V)	354	690	1200	1675	1900	2130	2200

The effective armature resistance is 0.25 ohms.

When short-circuit test was conducted, a field current of 50 A was required to circulate the full-load current. Determine the percentage voltage regulation of the alternator on full-load at 0.8 lagging power factor by mmf method. (13)

12. (a) An industrial plant has a load of 800 kW at of power factor of 0.8 lagging. It is desired to install a synchronous motor to deliver a load of 200 kW and also serve as a synchronous condenser to improve the overall power factor of the plant to 0.92. Determine the kVA rating of the synchronous motor and its power factor. Assume that the synchronous motor has an efficiency of 90 per cent. (13)

Or

(b) Explain 'V' and inverted 'V' curves. (13)

13. (a) An 8-pole, 50 Hz induction motor has a full-load slip of 2.5 per cent and a maximum torque of twice the full-load torque. At what value of slip does the maximum torque occur? (13)

Or

(b) The power input to a 500 V, 50 Hz, 6-pole, 3-phase induction motor running at 975 rpm is 40 kW. The stator losses are 1 kW and friction and windage losses are 2 kW. Calculate (13)

(i) the slip,

(ii) the rotor copper loss;

(iii) the output horse-power;

(iv) the efficiency.

14. (a) The rotor of a 4-pole, 50 Hz, 3-phase, slip-ring induction motor has a resistance of 0.25 Ω per phase and runs at 1440 rpm on full load. Calculate the external resistance per phase which must be added to lower the speed to 1200 rpm, the torque remaining constant in both the cases. (13)

Or

(b) Explain v/f control and slip power recovery scheme. (6+7)

15. (a) Explain the working of stepper motor and linear induction motor. (7+6)

Or

(b) Explain the various starting mechanisms for single phase induction motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A 400 V, 50 Hz, 6 pole, 3-phase induction motor has rotor resistance of 0.03 ohm and standstill rotor reactance per phase of 0.4 ohm. Calculate the speed of the motor when developing maximum torque and also calculate the ratio of maximum torque to full-load torque. The full-load speed is 960 rpm. (15)

Or

(b) A 4-pole 25 kVA, 400 V, 50 Hz, three-phase star connected synchronous generator gave the following test data. (15)

Field current, I_f (A)	2	4	6	8	10	12	14	16
No-load terminal voltage (V)	138	277	355	415	468	502	533	554
Zero power factor load terminal voltage (V)			0	108	218	295	346	415

Determine the voltage regulation at full-load 0.8 power factor lagging by Potier triangle method. The armature resistance is 0.2 ohms.