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Question Paper Code : 51014

B.E./B.Tech. DEGREE EXAMINATIONS, APRIL/MAY 2024.

Fourth Semester

Electrical and Electronics Engineering

EE 3405 — ELECTRICAL MACHINES — II

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the conditions for parallel operation of an alternator.

2. Distinguish the use of salient pole and round rotor synchronous machines.

3. What are the reasons if a 3-phase synchronous motor fails to start?

4. Differentiate Synchronous and Induction machine.

5. A 3 phase, 4 pole induction motor operates at 50 Hz supply frequency. Calculate the frequency of the rotor current at standstill and the speed at which the magnetic field of the stator is rotating.

6. How can the direction of rotation of a three phase induction motor be reversed?

7. Mention the different methods of speed control of three phase induction motor.

8. Specify the merits of rotor resistance control of Induction motor speed control.

9. Single phase induction motor is not a self-starting motor. Justify the statement.

10. List the applications of hysteresis motor.

PART B — (5 × 13 = 65 marks)

11. (a) With neat diagram, describe the construction and working of alternator. (13)

Or

(b) Discuss the parallel operation of two alternators with identical speed/load characteristics. (13)

12. (a) Draw the simplified equivalent circuit of synchronous motor and explain the effect of loading in synchronous motor at various power factors with help of phasor diagrams. (13)

Or

(b) The synchronous reactance per phase of a 3-phase, star connected 6600 V synchronous motor is 18 Ω. For a certain load the input is 900 kW at normal voltage and the induced line EMF is 8400 V. Determine the line current and power factor. (13)

13. (a) Describe the construction of circle diagram of an induction motor and explain how maximum torque is obtained. (13)

Or

(b) Draw and explain the torque-slip characteristics of cage and wound rotor motor. Also derive the expression for the maximum running torque. (13)

14. (a) With neat circuit explain the Static Scherbius system of slip power recovery scheme. Also state the merits of Scherbius system over Kramer system. (13)

Or

(b) List the various methods of starting of 3 phase induction motor and discuss any two methods of starting in detail. (13)

15. (a) Single phase induction motor is not self-starting. State the reason and explain about the double revolving field theory. (13)

Or

(b) Describe the constructional features and principle of operation of hysteresis motor and AC series motor. (13)

PART C — (1 × 15 = 15 marks)

16. (a) A three-phase induction motor runs at almost 1,000 rpm at no-load and 950 rpm at full load when supplied with power from a 50 Hz three-phase line. Calculate the following: (15)

(i) How many poles does the motor have?

(ii) What is the percentage slip at full load?

(iii) What is the corresponding frequency of rotor voltage?

(iv) What is the corresponding speed of the rotor field with respect to the rotor?

(v) What is the corresponding speed of the rotor with respect to the stator?

(vi) What is the corresponding speed of the rotor field with respect to the stator field?

(vii) What is the rotor frequency at the slip of 10 per cent?

Or

(b) Calculate the torque exerted by an 8-pole, 50-Hz, 3-phase induction motor operating with a 4 percent slip which develops a maximum torque of 150 kg-m at a speed of 660 RPM. The resistance per phase of the rotor is 0.5 Ω. (15)