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R 325

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2005.

Fourth Semester

Electrical and Electronics Engineering

EE 234 — ELECTRICAL MACHINES — II

Time : Three hours Maximum : 100 marks

Graph sheet may be supplied.

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the causes of harmonics in the voltage and current waves of electrical machinery?

2. Define coil span factor.

3. What are the requirements to be met with, for paralleling of alternators?

4. List out two advantages of synchronising lamps used for synchronising.

5. Mention the requirements of starting the two types of 3 phase induction motors.

6. Give the relationship between the following in a 3 phase induction motor :

   (a) Rotor input and rotor output.

   (b) Starting torque and applied voltage.

7. Draw the torque–slip curves of double–squirrel cage motor.

8. What are the specific characteristic features of the repulsion motor?

9. How can the direction of rotation of AC series motor be reversed?

10. List out four applications of shaded pole induction motor.

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PART B — (5 × 16 = 80 marks)

11. (i) The following data pertains to two similar alternators : 3 ph, 6600 V, 60 Hz, 1200 kVA Y connected, Resistance/ph = 1.05 Ω, Syn.reactance per ph. = 5 Ω.

Saturation curve :

Field current, A :	150	200	250	300	350	500
Terminal voltage, V :	5600	6490	7000	7400	7750	8500

When operating in parallel with a terminal voltage of 6600 V, the first machine supplies 90 A at 0.8 lag pf. If the load pf is 0.707 lag and total load is 1600 kN, determine the excitation of second alternator. (10)

(ii) Write a note on hunting of alternators. (6)

12. (a) (i) Define voltage regulation. What are the methods available for determination of voltage regulation of alternator? (4)

(ii) Explain any one of the indirect methods to determine voltage regulation, stating the assumptions, requirements and also comment on the merit and demerit of the method if any. (12)

Or

(b) (i) Give the constructional details of two types of alternators. (8)

(ii) A 3 ph, Y connected alternator has the following data :

Voltage required to be generated on O.C. is 4000 V at 50 Hz, speed is 500 rpm, stator slots/pole/ph is 3, conductors/slot is 12. Calculate the number of poles and useful flux/pole. Assume all conductors/ph to be connected in series and coil to be full pitched. (8)

13. (a) (i) In a 3 ph IM, maximum torque = 2 times the full load torque, starting torque = full load torque. Calculate the full load speed and speed at which maximum torque occurs. (8)

(ii) Deduce the power stages in a 3 ph. IM and also their relationships with gross torque Tg, overall efficiency, etc. (8)

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(b) (i) Obtain the approximate equivalent circuit of a 3 phase induction motor. (6)

(ii) A 3 ph, 400 V IM gave the test readings :

no load test : 400 V, 1250 W, 9 A

SC test : 150 V, 4 kW, 38 A

Draw the circle diagram.

If the normal rating is 14.91 kW, find from the circle diagram, the full load current and slip. (10)

14. (a) Explain the various starting schemes adopted in 3 ph. IMs. Analyse each scheme and compare them. (16)

Or

(b) (i) Explain the different speed control schemes available for polyphase induction motor from stator side. (8)

(ii) What is the concept of double field revolving theory? Describe in brief. (8)

15. (a) Write notes in brief on the following :

(i) Induction generator and A.C. series motor. (8)

(ii) Permanent magnet motors. (8)

Or

(b) (i) What are stepping motors? (2)

(ii) Discuss the types of stepper motors with an application for each. (3)

(iii) Explain the few important definitions associated with stepper motor. (4)

(iv) Explain the operation of any one type of stepper motor with neat sketches. (7)

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