D 4051

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2007.

Third Semester

Mechatronics Engineering

EE 1215 — ELECTRICAL MACHINES AND DRIVES

(Regulation 2004)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are the limitations of Ohm's law?

2. What is the main purpose of transformer?

3. Mention some of the applications of single phase induction motor.

4. Which type of motor purposely uses the eddy current phenomenon to generate torque?

5. Mention the limitation of field control.

6. Why squirrel cage induction motors are not used for loads requiring high starting torque?

7. What are the typical elements of an Electric Drive?

8. What are the assumptions made while performing heating and cooling calculation of an electric motor?

9. What is VVVF control?

10. List out the advantages of static Kramer system over static Scherbius system.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Derive an expression for determination of EMF equation of a single phase transformer. (6)

(ii) A voltage of $v(t) = 141.4 \sin wt$ is applied to the circuit shown in figure. The circuit dissipates 450 W at a lagging power factor, when the voltmeter and ammeter readings are 100 V and 6A respectively. Calculate the circuit constants.

(10
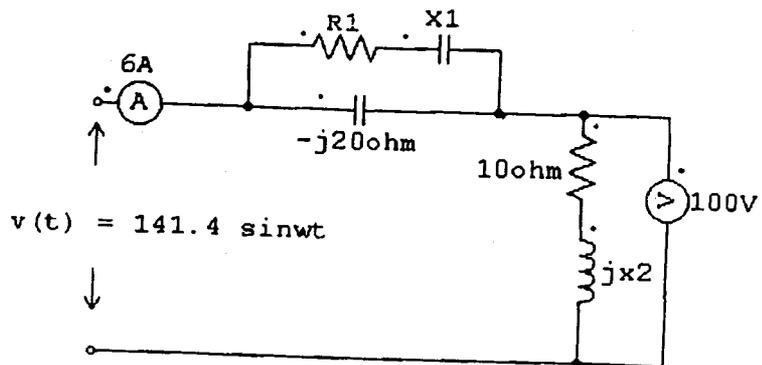
Or

(b) Find the branch currents in the network shown in Figure 1 using loop current method.

(16)
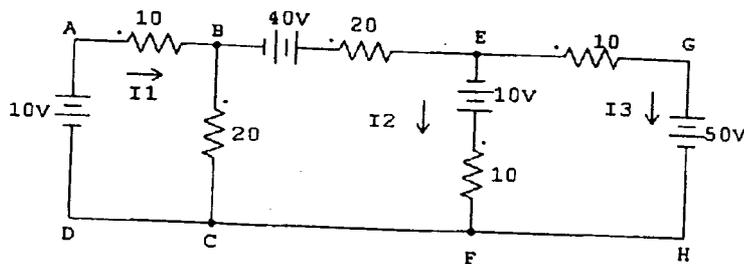

Figure 1

12. (a) With neat diagram explain the construction and principle of operation of synchronous motor.

(16)

Or

(b) (i) What are stepper motor? How they differ from reluctance motors?

(4)

(ii) With neat sketch explain the double revolving field theory of single phase induction motor.

(12)

3. (a) Explain how the speed of a d.c. shunt motor can be varied both above and below the speed at which it runs with full field current. (16)

Or

(b) Explain how an induction motor is brought to stop by (16)

(i) Plugging and

(ii) Dynamic braking.

14. (a) Discuss briefly the different classes of duty of electrical drive. (16)

Or

(b) The thermal time constant and final steady temperature of a motor on continuous running are 30 minutes and 600 C. Find out the temperature

(i) after 15 minutes at this load

(ii) after 1 hour at this load

(iii) if temperature rise at 1 hour rating is 600 C, find the maximum steady temperature

(iv) What will be the time required to increase the temperature from 400°C to 600°C at 1 hour rating? (16)

15. (a) Explain the chopper circuits used to control the speed of D.C. motors. (16)

Or

(b) Explain the principle of stator voltage control and voltage/frequency control scheme of induction motor. (16)

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