B 2194

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

Third Semester

Computer Science and Engineering

EE 255 — ELECTRICAL ENGINEERING AND CONTROL SYSTEMS

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. A resistor with a current of 3 A through it converts 500 J of electrical energy to heat energy in 12 sec. What is the voltage across the resistor?

2. For the circuit shown in Fig. 1, determine the unknown voltage drop V_1.

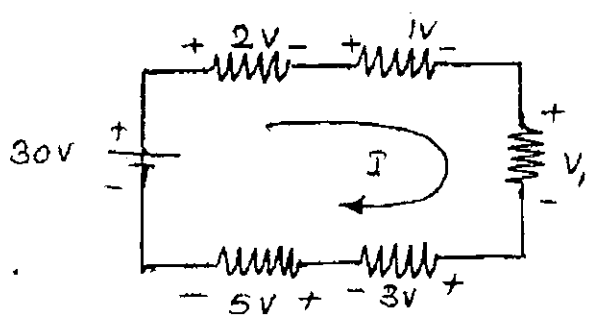

Fig. 1

3. Draw the efficiency curve of transformer.

4. What are the classifications of DC motor?

5. List out any two industrial applications of 3 phase Induction motor.

6. Write any two applications of synchronous motor.

7. Draw the general block diagram of a closed loop control system.

8. Define Transfer function.

9. What is a state space?

10. What is a state diagram?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Find the current in the 10 Ω resistance, V_1 and source voltage V_s in the circuit shown in Fig. 2.

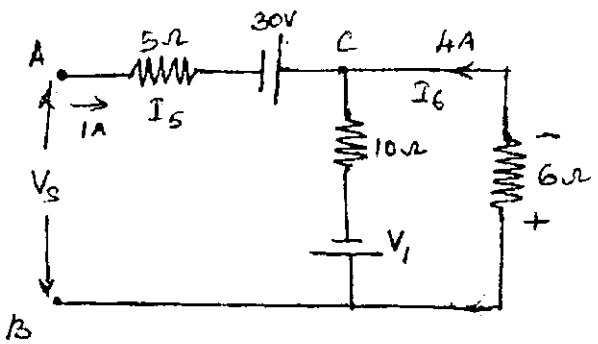

Fig. 2

(ii) A 5 Ω resistor has a voltage rating of 100 V, what is its power rating?

Or

(b) (i) Determine the mesh current I_1 in the circuit, shown in Fig. 3.

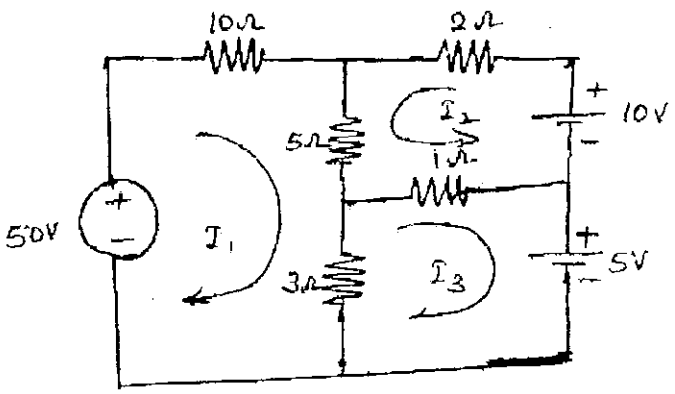

Fig. 3

(ii) Find .the voltage between A and B in a voltage divider network shown in Fig. 4.

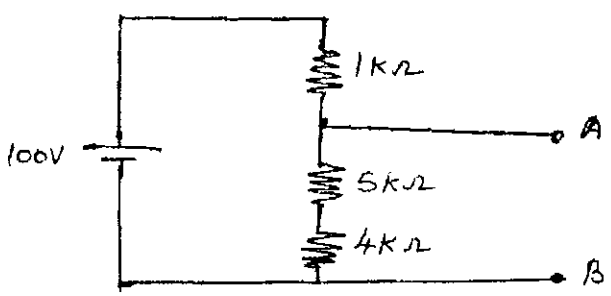

Fig. 4

12. (a)

(b)

13. (a)

(b)

14. (a)

R

12. (a) (i) Explain the working principle of Generator with a neat sketch.

(ii) A 4 pole dc motor in lap–wound with 400 conductors. The pole shoe is 20 cm long and the average flux density over one pole pitch is 0.4 T. The armature being 20 cm. Find the torque and mechanical power developed when motor is drawing 25 A and running at 1500 rpm.

Or

(b) (i) Explain the external characteristics of DC shunt generator with a neat circuit diagram.

(ii) Draw the circuit and explain the self excited generator with no load characteristic curve.

13. (a) Explain in detail the principle, construction and working of longitudinal cross-sectional view of variable reluctance motor.

Or

(b) With a neat sketch, explain the working of hybrid stepper motor.

14. (a) For the block diagram shown in Fig. 5, find the closed loop transfer function of the system using block diagram reduction technique.

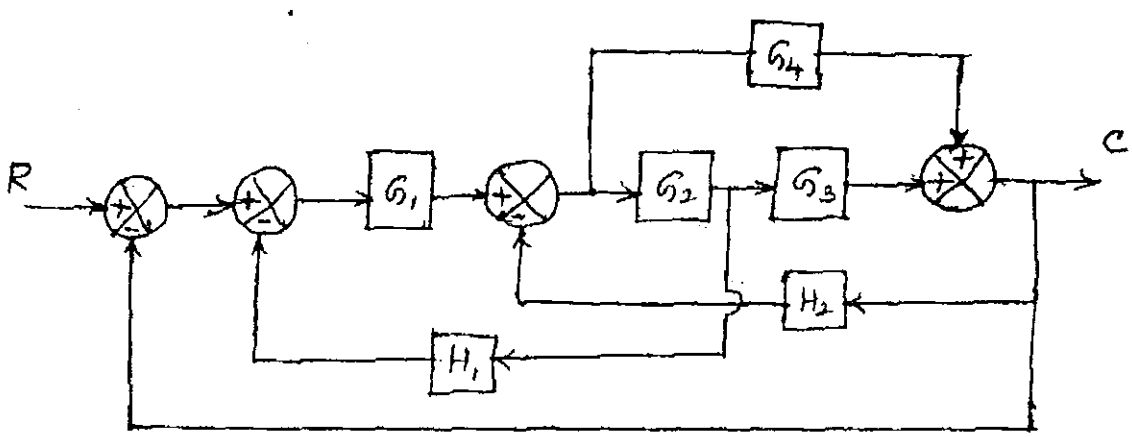

Fig. 5

Or

(b) Obtain the overall transfer function C/R from the signal flow graph shown in Fig. 6.

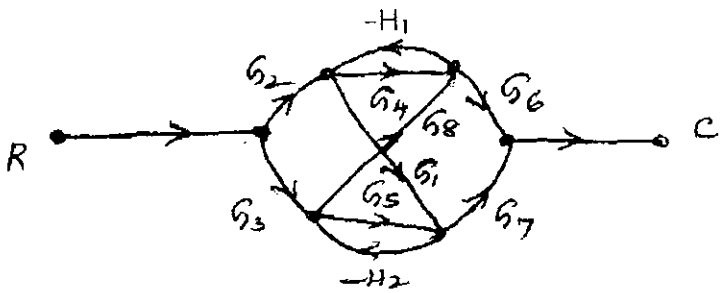

Fig. 6

15. (a) Obtain the state model of electrical network shown in Fig. 7 by choosing $V_1(t)$ and $V_2(t)$ as state variables.

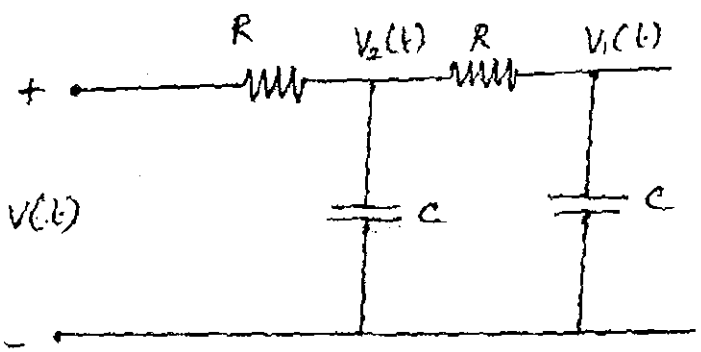

Fig. 7

Or

(b) (i) Sketch the basic elements used to construct the block diagram and signal flow graph of a state model.

(ii) Draw the block diagram of the system described by the state model.

$$\begin{bmatrix} \dot{X}_1 \\ \dot{X}_2 \\ \dot{X}_3 \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & a_2 & a_3 \end{bmatrix} \begin{bmatrix} X_1 \\ X_2 \\ X_3 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u \text{ and } y = X_1.$$