

**S 9138**

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2006.

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. State Kirchhoff's laws.
2. Give the v-i relationship of resistance, excited by sinusoidal voltage.
3. Draw the external load characteristics of shunt generator and cumulative compound generator.
4. A 220 V shunt motor has an armature resistance of 0.2 ohm and field resistance of 110 ohm. The motor draws 5 A at 1500 rpm at no load. Calculate the speed if the motor draws 52 A at rated voltage.
5. What are the classifications of Single Phase Induction motors based on the construction and method of starting?
6. Why variable reluctance stepper motor is called as a variable reluctance motor?
7. What is a control system?
8. Define Mason's Gain formula.
9. What is a state model of a system?
10. What is an order of a system? Give one example.

PART B — (5 × 16 = 80 marks)

11. (a) (i) Determine the current supplied by each battery in the circuit shown in Fig. 1 using mesh analysis.

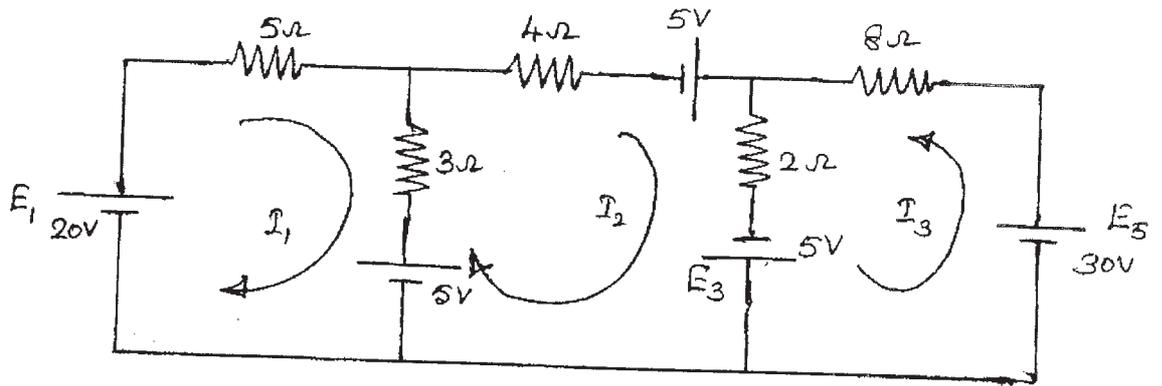


Fig. 1 Q.11(a)(i)

- (ii) Determine the current in the  $4\Omega$  branch in the circuit shown in Fig. 2.

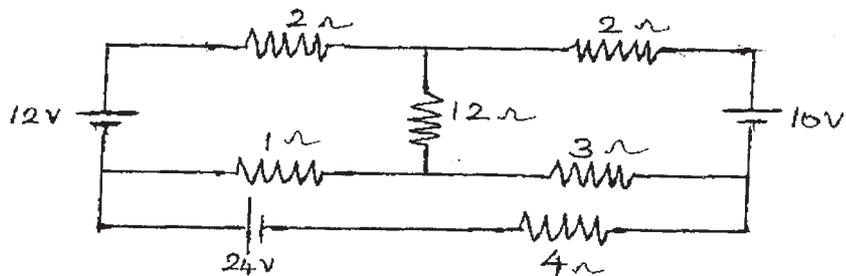


Fig.2 Q. 11(a)(ii)

Or

- (b) (i) Define average power, complex power and reactive power and mention their units.  
 (ii) Calculate the power dissipated in the circuit shown in Fig. 3.

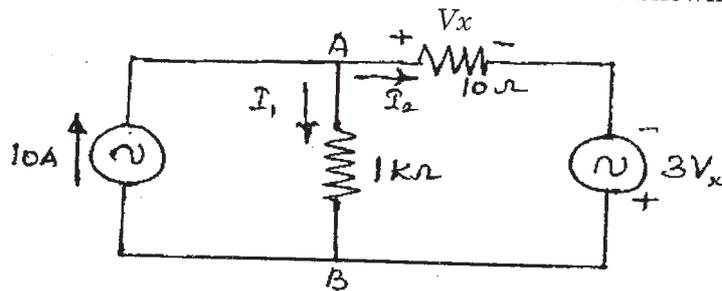


Fig. 3 Q. 11(b)(ii)

12. (a) (i) With a neat sketch, explain the working principle of a transformer.
- (ii) A 25 KVA transformer has 500 turns on the primary and 50 turns on the secondary winding. The primary is connected to 3000 V, 50 Hz supply. Find the full-load primary and secondary currents, the secondary e.m.f. and the maximum flux in the core. Neglect leakage drops and no-load primary current.

Or

- (b) (i) What are the conditions necessary for build-up of a shunt generator.
- (ii) Explain the load characteristics of a compound motor with a neat diagram.

13. (a) Describe the equivalent circuit of a single phase Induction motor
- (i) Without Core loss
- (ii) With Core loss.

Or

- (b) Explain in detail the principle, construction and working of a Shaded Pole Single Phase Induction Motor.

14. (a) What are known as Open loop and Closed loop control system? Illustrate their principle of working with an example.

Or

- (b) For the block diagram shown in Fig. 4, construct (i) equivalent signal flow graph for the block diagram (ii) Obtain C/R by the application of Mason's formula.

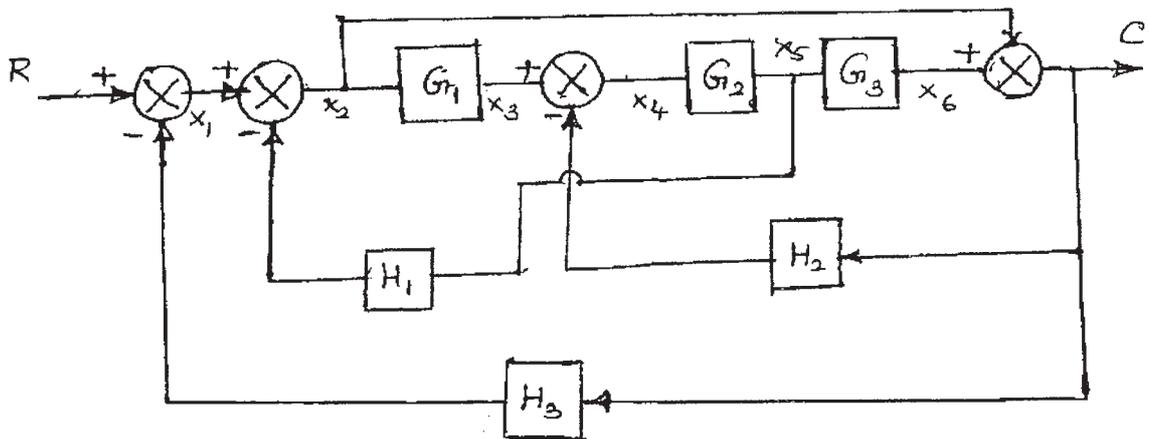


Fig. 4 Q. 14(b)

15. (a) (i) An unity feedback system has a forward path T.F. given by  $G(s) = 10/s(s + 2)$ . Find the maximum overshoot and time at which it occurs for a step input of 20 units.
- (ii) The closed loop poles of a second order system are  $(-2 + j3)$  and  $(-2 - j3)$ . Compute the value of damping ratio, natural frequency of oscillation and damped frequency of oscillation. What is percentage overshoot for a unit step input?

Or

- (b) (i) Define state and state variables.
- (ii) Obtain the state model of the RLC network shown in Fig. 5.

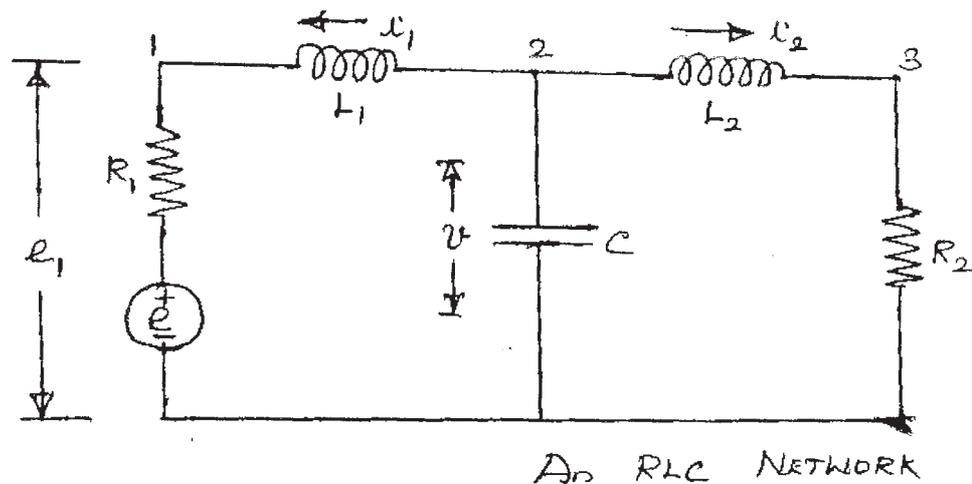


Fig. 5 Q. 15(b)(ii)