K 1198

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2004.

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. Give the algorithm of mesh current analysis.

2. Define power factor interms of power components and load parameters.

3. Draw the no–load vector diagram of single phase transformer.

4. Sketch the load characteristics of d.c. shunt generator.

5. Give the application of stepper motor.

6. Mention the disadvantages of shaded pole induction motor.

7. State the advantages of closed loop system.

8. Derive the transfer function of unity feed back system.

9. What are the advantages of state variable approach?

10. Define steady state error.

PART B — (5 × 16 = 80 marks)

11. (i) Explain briefly main parts of a d.c machine. (8)

(ii) A 230 V d.c. shunt motor takes an armature current of 6 A from 230 V mains at no load and runs at 1200 rpm. The armature resistance is 0.2 Ω. Determine the speed and torque developed by the motor with 37 A armature current and the same flux. (8)

12. (a) (i) Find the current through 2 Ω resistance in the network using loop current analysis (Fig Q. 12 (a) (i)). (8)

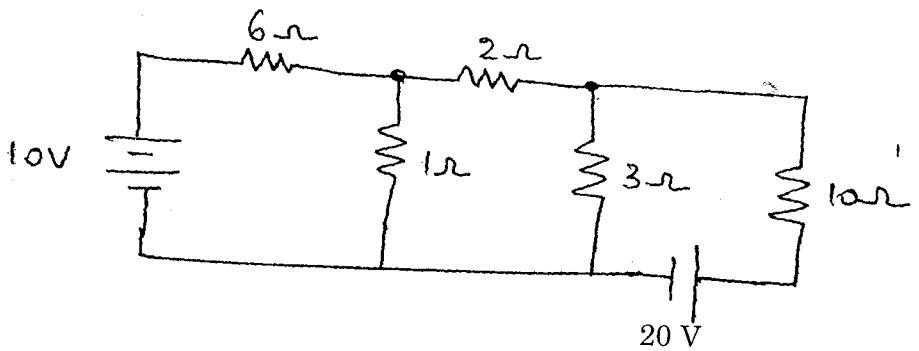

Fig Q. 12 (a) (i)

(ii) Verify the result using Node Voltage Analysis. (8)

Or

(b) A series RLC circuit has $R = 20\ \Omega$, $L = 0.005$ H and $C = 0.2 \times 10^{-6}$ F. It is fed from a 100 V variable frequency source. Find (i) frequency at which current is maximum (ii) impedance at this frequency (iii) voltage across inductance at this frequency (iv) maximum value of voltage across inductance and frequency at which this occurs. (v) maximum value of voltage across capacitance and the frequency at which this occurs.

13. (a) (i) Explain O.C. and S.C. tests on single phase transformer. (8)

(ii) Develop the equivalent circuit from the above tests. (8)

Or

(b) (i) Explain the operation of variable reluctance motor. (8)

(ii) Explain the operation of hybrid stepper motor. (8)

14. (a) Obtain the closed loop transfer function of the system shown in Fig. Q. 14 (a) using the block diagram reduction technique.

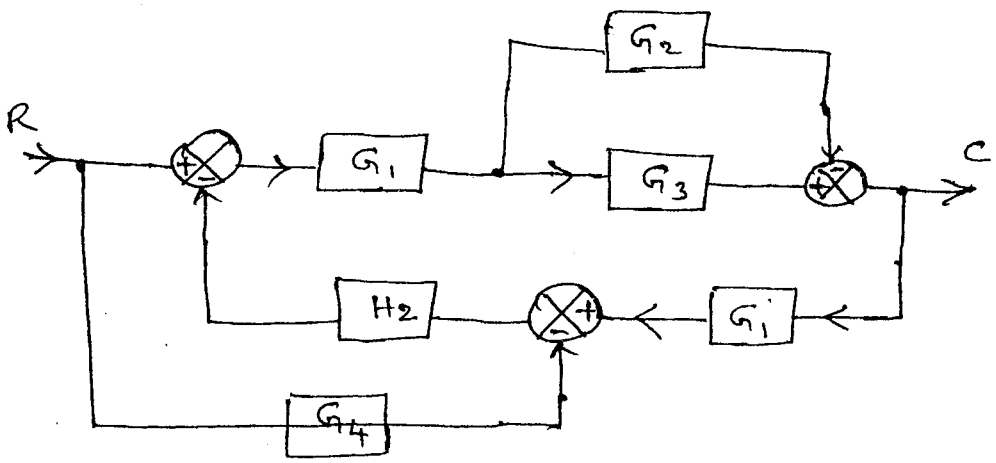

Fig. Q. 14 (a)

Or

(b) Draw the signal flow graph and evaluate the closed loop transfer function of the system shown in Fig. Q. 14 (a) above.

15. (a) Obtain the state model of the electro mechanical system shown in Fig. Q. 15 (a)

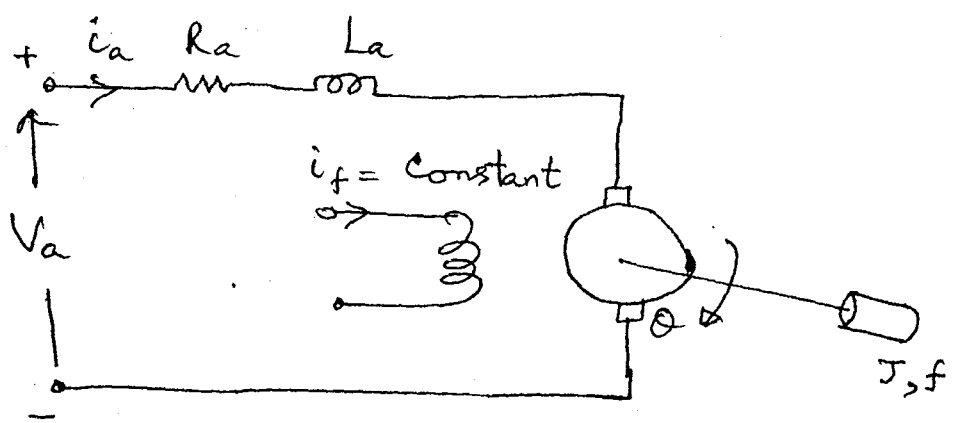

Fig. Q. 15 (a)

Or

(b) (i) What are time domain specifications? Explain. (8)

(ii) For a second order system whose open loop transfer function is $G(S) = \frac{4}{S(S+2)}$, determine the maximum overshoot, the time to reach the maximum overshoot when a step displacement of 18° given to the system. (8)
