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Question Paper Code : P 1291

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2009.

Fourth Semester

Computer Science and Engineering

EE 1291 — ELECTRICAL ENGINEERING AND CONTROL SYSTEMS

(Regulation 2004)

Time : Three hours Maximum : 100 marks

(Semilog sheets and polar plots will be provided)

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Obtain the equation for the voltage across any resistance in a series circuit having 'n' number of different resistances.

2. What is the formulae for 3 phase power?

3. What is a generator?

4. Why is a transformer core laminated?

5. Classify the types of induction motors based on starting.

6. Define open loop and closed loop control system.

7. Define rise time and peak time.

8. What is the disadvantage of Bode plot over Polar plot?

9. Determine the stability of the system whose characteristic equation is given by $s^4 + 6s^3 + 23s^2 + 40s + 50 = 0$.

10. The output of a linear system for a unit step input is given by t^2e^{-t}. What is its transfer function?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Using nodal analysis, obtain the currents flowing in all the resistors as shown in fig. 1. (8)

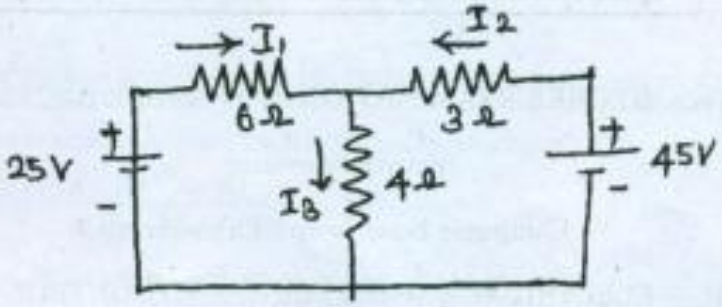

Fig. 1

(ii) Simplify the block diagram shown in Fig. 2 and obtain the closed loop transfer function $C(s)/R(s)$. (8)

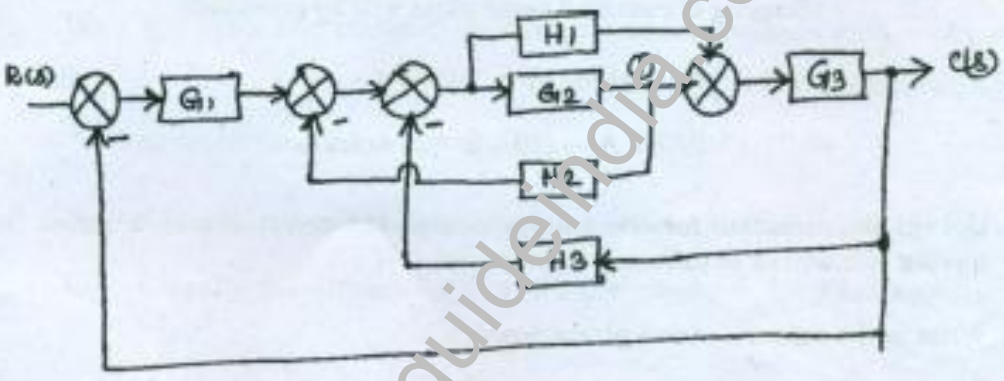

Fig. 2

Or

(b) (i) A battery having emf of 12 V is connected across the terminals *AB* of the circuit shown in fig 3. Find

(1) current flowing in each resistance (6)

(2) total power absorbed by the circuit. (2)

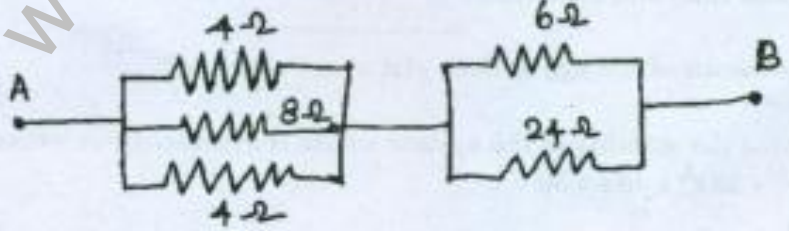

Fig. 3

(ii) Obtain the transfer function $Y(s)/X(s)$ of the signal flow graph shown in fig. 4. (8)

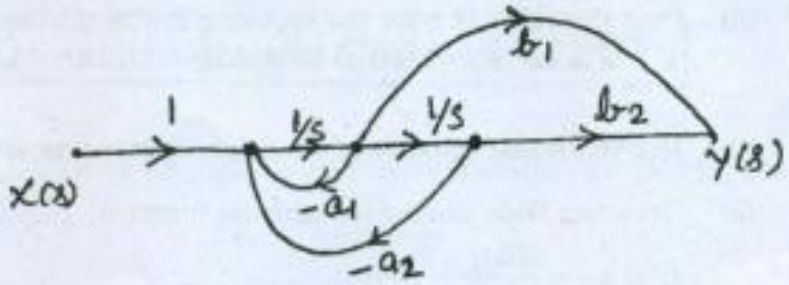

Fig. 4

12. (a) (i) A resistance of 100 ohm is connected in series with a 50 μF capacitor to a supply at 200 V, 50 Hz. Find (1) impedance, current, power factor and phase angle (2) voltage across resistor and capacitor. Draw also the phasor diagram. (8)

(ii) Obtain the unit-impulse response of first order systems. (8)

Or

(b) (i) Explain the measurement of 3-φ power by two-wattmeter method for a balanced star-connected load. (8)

(ii) For the system shown in fig. 5, find the value of 'a' with a damping ratio of 0.5. Determine the rise time, peak time, maximum overshoot and settling time in the unit-step response. (8)

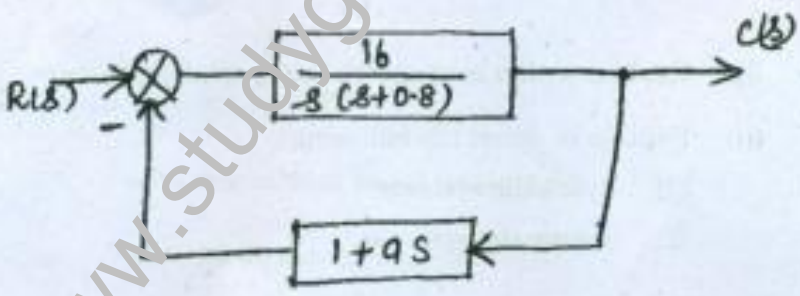

Fig. 5

13. (a) (i) Explain the constructional details and operating principle of D.C. generator. (8)

(ii) What are the necessary and sufficient conditions for stability? Explain. (8)

Or

(b) (i) Discuss in detail the different characteristics of DC shunt generator. (8)

(ii) Find the value of k for the system given by characteristic equation $s^4 + s^3 + ks^2 + s + 1 = 0$ to be stable. (8)

14. (a) (i) Derive the emf equation of single-phase core-type transformer. (6)

(ii) Draw the Bode plot for the transfer function

$$G(s) = \frac{200(s+2)}{s(s^2+10s+100)}$$

and determine gain margin and phase margin. (10)

Or

(b) (i) Explain the construction and operating principle of a 3-ϕ squirrel cage induction motor. (8)

(ii) The open loop transfer function of a unity feedback system is given by $G(s) = \frac{1}{s(1+s)(1+2s)}$. Sketch the polar plot and determine the gain margin and phase margin. (8)

15. (a) (i) Explain in detail the starting methods of 1ϕ induction motor. (8)

(ii) Classify the different types of DC servomotor. Explain any one in detail. (8)

Or

(b) (i) Explain with a neat sketch the operation of stepper motor. (8)

(ii) Explain in detail the following :

(1) hydraulic systems

(2) pneumatic systems. (4 + 4)