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

Fourth Semester

Computer Science and Engineering

EE 1291 — ELECTRICAL ENGINEERING AND CONTROL SYSTEMS

(Regulation 2004)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. State Kirchoff's laws.

2. Define power factor in a circuit.

3. What are the types of armature windings available in D.C. machines?

4. What are the types of transformers according to their constructional details?

5. What are the types of single phase induction motors?

6. Define "control system".

7. Define "time response" of a control system.

8. Define "critically or marginally stable system".

9. Define frequency response of a system.

10. What are the basic classification of d.c. servomotors?

11. (a) (i) What are the points to be considered for mesh analysis? Calculate the current through 6 Ω resistance using mesh analysis in fig. 1.

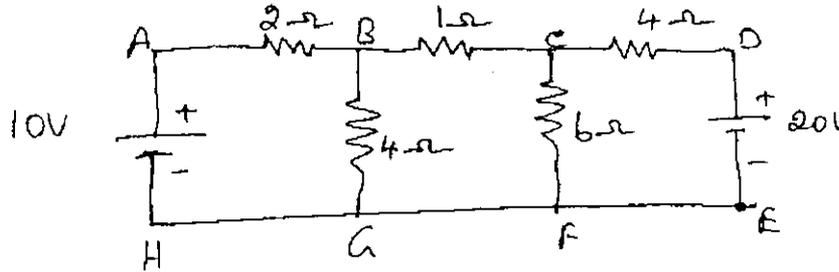Fig. 1   (3 + 5)

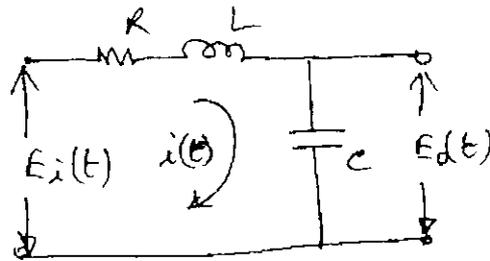(ii) Define transfer function of a system. Find out the T.F. of the given network in fig. 2.

Fig. 2   (2 + 6)

Or

(b) (i) For the circuit shown in fig. 3, (1) Find the equivalent resistance across the supply. (2) If the voltage drop across 5Ω is 100 V, find the supply voltage. (3) Find the power consumed by each resistance.
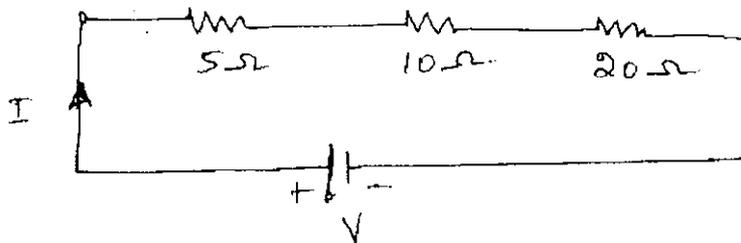(8)

Fig. 3

12. (a)

(b)

13. (a)

(b)

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(ii) The transfer function of a system is given by

$$T(s) = \frac{k(s+6)}{s(s+2)(s+5)(s^2+7s+12)} \cdot \text{Determine}$$

(1) poles (2) zeros (3) characteristic equation and (4) pole-zero plot in s-plane. (8)

12. (a) An impedance consumes a power of 60 watts and takes a current of $10\text{-}j8$ A when connected to a source of $a+j5$ V. Find "a" and circuit elements. (16)

Or

(b) A system has open loop transfer function as :

$$G(s)\,H(s) = \frac{10}{s(s+5)} \cdot$$

Find the undamped natural frequency, the damping ratio, the damped natural frequency, the rise time, peak time, peak overshoot and the setling time with 2% criterion. (16)

13. (a) (i) Draw the constructional details of a typical D.C. machine. (10)

(ii) List the advantages of Routh's criterion method of finding stability of control system. (6)

Or

(b) (i) Draw the following characteristics of a D.C. series motor.

(1) T Vs Ia

(2) N Vs Ia

(3) N Vs T with usual notations. (8)

(ii) Examine the stability by Routh's criterion for the characteristic equation shown below :

$$s^4 + 6s^3 + 26s^2 + 56s + 80 = 0.$$ (8)

14. (a) (i) Draw the different core-sections of a transformer. (4)

(ii) List the advantages and applications of Bode plot. (12)

Or

(b) (i) Draw the power flow diagram of a 3 phase induction motor. What are the different types of starters used in 3 phase induction motors. (4 + 4)

(ii) Consider $G(s)\,H(s) = \dfrac{1}{s(1+T_1 s)(1+T_2 s)}$.

Draw a typical polar plot for the given transfer function. (8)

15. (a) Draw the schematic diagram of single phase capacitor start induction motor, capacitor start capacitor run induction motor and the torque-speed characteristics of both. (16)

Or

(b) (i) Explain the basic working principles of D.C. servomotor. (8)

(ii) Draw the torque-speed characteristics of a.c. servomotor. (8)

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