Total No. of Questions: 6

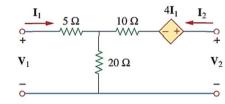
Total No. of Printed Pages:4

Enrollment No.....

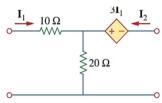
OR iii. Find f(t) given that-

$$F(s) = \frac{s^2 + 12}{s(s+2)(s+3)}$$

- Derive expression for the Transmission parameters in terms of Z 4 O.5 i. parameters for a two-port network.
 - Compute the z parameters of the circuit as shown below-



Find the transmission parameters for the two-port network as shown 6 OR iii. below-



Q.6 Attempt any two:

> Synthesize the Foster I and II forms of realization of the R-C driving- 5 point function.

$$Z_D(s) = \frac{2s^2 + 12s + 16}{s^2 + 4s + 3}$$

Synthesize first and second Foster and Cauer forms of the LC driving- 5 point impedance function.

$$Z_D(s) = \frac{(s^2 + 1)(s^2 + 16)}{s(s^2 + 4)}$$

Determine the Foster first form and Cauer second form after 5 synthesizing the R-L driving-point impedance function.

$$Z(s) = \frac{2(s+1)(s+3)}{(s+2)(s+4)}$$

7

6

Faculty of Engineering

End Sem (Odd) Examination Dec-2022 EC3CO05 Circuit Analysis & Synthesis

Programme: B.Tech.

Branch/Specialisation: EC

Duration: 3 Hrs.

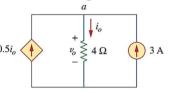
Maximum Marks: 60

1

1

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

The current i_0 in the circuit of the figure shown below-



(a) 8A

(b) 10A

(c) 6A

(d) 12A

 R_{eq} for the circuit of the figure shown below is-

(a) $R_{eq} = 18.3 \Omega$

(b) $R_{eq} = 17.3 \,\Omega$

(c) $R_{eq} = 10.2 \Omega$

(d) $R_{eq} = 14.4 \Omega$

The Thevenin resistance at terminals a and b of the circuit as shown in 1 figure 1 is-

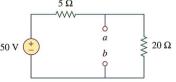


Figure 1

(a) $R_{Th} = 25 \Omega$

(b) $R_{Th} = 15\Omega$

(c) $R_{Th} = 20 \Omega$

(d) $R_{Th} = 4\Omega$

The Thevenin voltage at terminals a and b of the circuit as shown in 1 figure 1 is-

(a) $V_{Th} = 50V$

(b) $V_{Th} = 40 \text{V}$

(c) $V_{Th} = 20V$

(d) $V_{Th} = 10V$

P.T.O.

- The impedance of a 10-F capacitor is-
 - (a) $\frac{10}{s}$
- (b) $S/_{10}$
- (c) $^{1}/_{10s}$
- (d) 10s

1

1

1

- If the input to a linear system is $\delta(t)$ and the output is $e^{-2t} u(t)$ the 1 transfer function of the system is-
- (b) $\frac{1}{s-2}$ (c) $\frac{s}{s+2}$
- vii. Which of the following equations is called the state equation?
 - (a) $\dot{x} = Ax + Bz$

- (b) y = Cx + Dz
- (c) H(s) = Y(s) / Z(s)
- (d) $H(s) = C(sI A)^{-1}B$
- viii. For the single-element two-port network in Figure is-
 - (a) 0
- (b) 5

- (c) 10
- (d) Undefined
- A system with unity feedback having open loop transfer function as-

$$G(s) = \frac{K(s+1)}{s^3 + as^2 + 2s + 1}$$

What values of 'K' and 'a' should be chosen so that the system oscillates?

(a) K = 2, a = 1

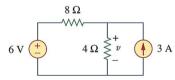
(b) K = 2, a = 0.75

(c) K = 4, a = 1

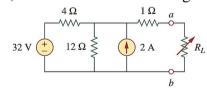
- (d) K = 4. a = 0.75
- The polynomial $s^4 + Ks^3 + s^2 + s + 1 = 0$ the range of K for 1 stability is-
 - (a) K > 5

a - b

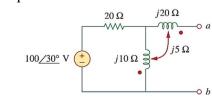
- (b) -10 < K
- (c) K > -4 (d) K 1 > 0
- Q.2 i. Use the superposition theorem to find v of the circuit shown below-



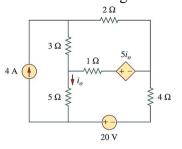
Find the Thevenin equivalent circuit of the circuit shown below to the 3 left of the terminals, then find the current through R_L , assume $R_L = 6\Omega$



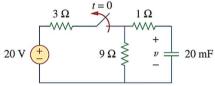
Find the Norton equivalent for the circuit shown below at terminals 5



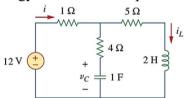
OR iv. Find i_0 in the circuit as shown in the Figure 6 using superposition.



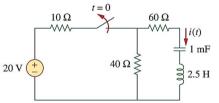
Q.3 i. The switch in the circuit shown below has been closed for a long time, 2 and it is opened at t = 0. Calculate the initial energy stored in the capacitor.



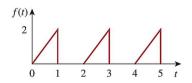
Consider the circuit shown below, under dc conditions, find: (a) i, v_c 8 and i_L , and (b) the energy stored in the capacitor and inductor.



OR iii. Find i(t) for t > 0 in the circuit shown below-



- Determine the Laplace transform of $t^2 Sin 2t u(t)$ Q.4 i.
 - Calculate the Laplace transform of the periodic function in the figure 7 shown below-



3

5

OR iii. Find f(t) given that-

Derive expression for the Transmission parameters in terms of Z 4

parameters for a two-port network.

Compute the z parameters of the circuit as shown below-

$$Z_{11} = 25 \Omega$$
 V_1
 $V_2 = 20 \Omega$
 V_3
 V_4
 V_5
 V_6
 V_7
 V_8
 V_8
 V_8
 V_9
 V_9

OR iii. Find the transmission parameters for the two-port network as shown 6

Attempt any two:

Synthesize the Foster I and II forms of realization of the R-C driving-

Fig. 1. Synthesize the Poster F and II forms of realization of the R-C driving-
point function.
Fig. 2. If
$$R_2 = V_3$$
 is $C_2 = 4$ F $Z_p(s) = \frac{2s^2 + 12s + 16}{s^2 + 4s + 3}$ Not Possible.

ii. Synthesize first and second Foster and Cauer forms of the LC driving- 5

point impedance function.

$$C_0 = 0.25 \text{ F}, C_1 = 0.111 \text{ F}$$
 $L_0 = 1 \text{ H}$
 $L_1 = 2.25 \text{ H}$
 $L_2 = 2.25 \text{ H}$
 $L_3 = 0.56 \text{ F}$
 $L_4 = 0.56 \text{ F}$
 $L_5 = 0.56 \text{ F}$
 $L_6 = 0.56 \text{ F}$
 $L_7 = 0.56 \text{ F}$
 $L_8 = 0.56 \text{ F}$
 $L_9 = 0.56 \text{ F}$
 L

iii. Determine the Foster first form and Cauer second form after 5 synthesizing the R-L driving-point impedance function.

Foster-firm-I - Not Possible.

Ro =
$$\frac{4}{3}$$
 \(\Lambda\), \(\Lambda\) = 0.43H

R1 = $\frac{44}{49}$ \(\Lambda\), \(\Lambda\) = 0.043H

R2(s) = $\frac{2(s+1)(s+3)}{(s+2)(s+4)}$

R2(s) = $\frac{2(s+1)(s+3)}{(s+2)(s+4)}$

R2(s) = $\frac{2(s+1)(s+3)}{(s+2)(s+4)}$

R3 = $\frac{4}{3}$ \(\Lambda\), \(\Lambda\) = 0.043H

R4 = $\frac{4}{49}$ \(\Lambda\), \(\Lambda\) = 7.33 \(\Lambda\)

Total No. of Questions: 6



Total No. of Printed Pages:4

Enrollment No...



Faculty of Engineering End Sem (Odd) Examination Dec-2022

EC3CO05 Circuit Analysis & Synthesis

Programme: B.Tech.

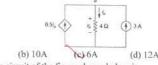
Branch/Specialisation: EC

Duration: 3 Hrs.

Maximum Marks: 60

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d.

Q.1 i. The current i_0 in the circuit of the figure shown below-



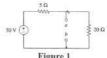
 R_{eq} for the circuit of the figure shown below is-



(a)
$$R_{eq}=18.3~\Omega$$
 (b) $R_{eq}=17.3~\Omega$

(c)
$$R_{eq} = 10.2 \Omega$$
 (d) $R_{eq} = 14.4 \Omega$

The Thevenin resistance at terminals a and b of the circuit as shown in 1 figure 1 is-



(a) $R_{Th} = 25 \Omega$ (b) $R_{Th} = 15\Omega$

(c)
$$R_{Th} = 20 \Omega$$
 (d) $R_{Th} = 4\Omega$

The Thevenin voltage at terminals a and b of the circuit as shown in 1

figure 1 is-

(a) $V_{Th} = 50 \text{V}$ $(b)V_{Th} = 40V$

(c) $V_{Th} = 20V$ (d) $V_{Th} = 10V$

P.T.O.

The impedance of a 10-F capacitor is- $(a)^{10}/s$ (c) $^{1}/_{10s}$ (b) s/10(d) 10s If the input to a linear system is $\delta(t)$ and the output is $e^{-2t}u(t)$ the 1 transfer function of the system is-(b) $\frac{1}{s-2}$ (a) $\frac{1}{s+2}$ vii. Which of the following equations is called the state equation? (a) $\dot{x} = Ax + Bz$ (b) y = Cx + Dz(c) H(s) = Y(s) / Z(s)(d) $H(s) = C(sI - A)^{-1}B$ viii. For the single-element two-port network in Figure is-(a) 0 (b) 5 (c) 10 (d) Undefined A system with unity feedback having open loop transfer function as- $G(s) = \frac{K(s+1)}{s^3 + as^2 + 2s + 1}$ What values of 'K' and 'a' should be chosen so that the system oscillates? (a) K = 2, a = 1(b) K = 2, a = 0.75(c) $K = 4, \alpha = 1$ (d) K = 4, a = 0.75The polynomial $s^4 + Ks^3 + s^2 + s + 1 = 0$ the range of K for 1 stability is-(c) K > -4 (d) K - 1 > 0(a) K > 5(b) -10 < KQ.2 $\stackrel{\smile}{\sim}$ Use the superposition theorem to find v of the circuit shown below-8.02 10h ii. Find the Thevenin equivalent circuit of the circuit shown below to the 3 left of the terminals, then find the current through R_L , assume $R_L = 6\Omega$

32 V (12 Ω €

a - b

iii. Find the Norton equivalent for the circuit shown below at terminals 5

/10 Ω ₹ 15 Ω

OR iy. Find i_0 in the circuit as shown in the Figure 6 using superposition.

Q.3 i. The switch in the circuit shown below has been closed for a long time, 2 and it is opened at t=0 . Calculate the initial energy stored in the

$$V(\bar{o}) = V(\bar{o}^+) = 15 \frac{V}{20 \text{ y}}$$

$$90 \times \frac{10}{4} = 20 \text{ mF}$$

ii. Consider the circuit shown below, under dc conditions, find: (a) i , $v_{\mathcal{C}}$ 8 and i_L , and (b) the energy stored in the capacitor and inductor.

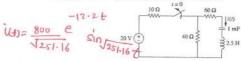
$$i(\infty) = i_L(\infty) = 2 A$$

$$V_L(\infty) = 10 V$$

$$12V \odot \qquad i_{C} = 1F$$

$$E_L = 4 J$$

OR iii. Find i(t) for t > 0 in the circuit shown below-



Determine the Laplace transform of $t^2Sin\ 2t\ u(t)$

Calculate the Laplace transform of the periodic function in the figure shown below-

