Printed Page:- **Subject Code:- AEC0303**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech

SEM: III - CARRY OVER THEORY EXAMINATION - APRIL 2023

Subject: Signals, Systems and Networks

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*

1. *This Question paper comprises of* **three Sections -A, B, & C.** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*

2. *Maximum marks for each question are indicated on right -hand side of each question.*

3. *Illustrate your answers with neat sketches wherever necessary.*

4. *Assume suitable data if necessary.*

5. *Preferably, write the answers in sequential order.*

6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION A **20**

1. Attempt all parts:-

1-a. 1

A system defined by $y[n] = \sum_{k=-\infty}^{n} x[k]$ is example of (CO1)

(a) invertible system

(b) memoryless system

(c) non-invertible system

(d) averaging system

1-b. Which of the following equation describes a linear time-varying discrete time system. (CO1) 1

(a) y(k+2) + k y(k+1) + y(k) = u(k)

(b) $y(k+2) + k\,y^2(k+1) + y(k) = u(k)$

(c) y(k+2) + 3 y(k+1) + y(k) = u(k)

(d) $y(k+2) + y^2(k+1) + y(k) = u(k)$

1-c. The Fourier series representations are based on using (CO2) 1

(a) constant coefficients

(b) only cosine functions

(c) only sine functions

(d) orthogonal function

1-d. The property of Fourier transform which states that the compression in the time domain is equivalent to expansion in the frequency domain is (CO2) 1

(a) duality

(b) scaling

(c) time scaling

(d) frequency shifting

1-e. In the circuit of Figure, i(∞) is: (CO3) 1

(a) 8 A

(b) 6 A

(c) 4 A

(d) 0 A

1-f. Laplace transform if cos(at)u(t) is? (CO3) 1

(a) s/a^2+s^2

(b) a/a^2+s^2

(c) s^2/a^2+s^2

(d) a^2/a^2+s^2

1-g. In two-port networks the parameter D is called _____ (CO4) 1

(a) Open-circuit voltage ratio

(b) Negative short-circuit transfer impedance

(c) Open-circuit transfer admittance

(d) Negative short-circuit current ratio

1-h. If two port network is reciprocal as well as symmetrical, which one of the following relation is correct? (CO4) 1

(a) Z12 =Z21 and Z11 = Z22

(b) Y12 =Y21 and Y11 = Y22

(c) AD - BC =1 and A = D

(d) All of the above

1-i. When s is real, the driving point impedance function is _____ function and the driving point admittance function is _____ function. (CO5) 1

(a) real, real

(b) real, complex

(c) complex, real

(d) complex, complex

1-j. The poles and zeros of driving point impedance function and driving point admittance function lie on? (CO5) 1

(a) left half of s-plane only

(b) right half of s-plane only

(c) left half of s-plane or on imaginary axis

(d) right half of s-plane or on imaginary axis

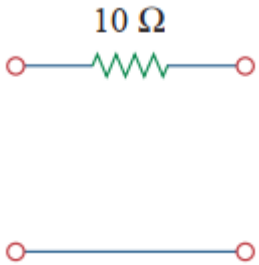
2. Attempt all parts:-

2.a. Define energy and power of the signal. (CO1) 2

2.b. Find the inverse Fourier transform of X(w) = δ(w) (CO2) 2

2.c. What are the types of Laplace transform? (CO3) 2

2.d. For the single-element two-port network in Fig. D, is: (CO4) 2



2.e. Consider the impedance function Z(s)=3(s+2)(s+4)/(s+1)(s+3).Realize by first Foster method. (CO5) 2

SECTION B **30**

3. Answer any <u>five</u> of the following:-

3-a. Define Causal system and Non Causal system. Check the given continuous time systems are stable or not (CO1) 6

$y(t) = t\,x(t)$

3-b. Find and draw the even part of (CO1) 6

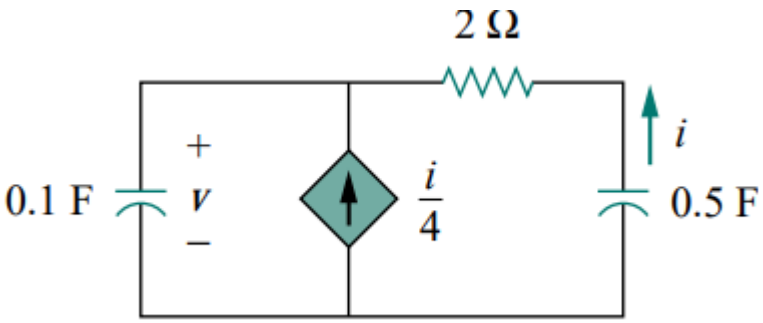
$x(t) = e^{-3t}u(t)$

3-c. What are the properties of Fourier transform. Find the Fourier transform of signal g(t) define by $g(t) = t\,e^{-at}\,u(t)$ (CO2) 6

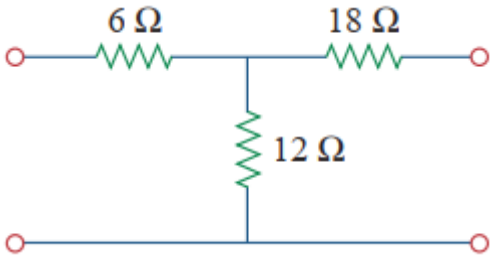
3-d. Find the convolution of the two continuous time signals (CO2) 6

f(t) =u(t)) , for all t and g(t) = u(t)

3.e. For the circuit in Figure, find v(t) for t > 0. Assume that $v(0^+) = 4$ V and $i(0^+) = 2$ A. (CO3) 6



3.f. Obtain **[z]** & **[y]** parameters for the T network shown in Fig. (CO4) 6



3.g. Check the positive realness of the following function. (CO5) 6
$(s^2 + 2s) / (s^2 + 1)$

SECTION C **50**

4. Answer any <u>one</u> of the following:-

4-a. Evaluate the following integrals. (CO1) 10

$(i) \int_{-2}^{1}(t + t^2)\delta(t-3)dt \quad (ii) \int_{-2}^{4}(t + t^2)\delta(t-3)dt \quad (iii) \int_{-\infty}^{\infty}(t^2 + \cos \pi t)\delta(t-1)dt \quad (iv) \int_{-\infty}^{\infty}(e^t)\delta(2t-2)dt$

4-b. Define Periodic and Non Periodic Signals.Determine weather or not given signals are periodic or not, If periodic find time period. (CO1) 10

1. $x(t) = je^{j10t}$
2. $x[n] = e^{j7\pi n}$

5. Answer any <u>one</u> of the following:-

5-a. Describe the properties of Laplace Transform.Find the Fourier transform of 10

$$\text{sgn}(t) = \begin{cases} 1, & t > 0 \\ -1 & t < 0 \end{cases}$$ (CO2)

5-b. Describe Fourier transform. Find the Fourier transform G(w) of the signal g(t) = 10

$\frac{1}{1 + t^2}$ (CO2)

6. Answer any <u>one</u> of the following:-

6-a. Find f (t) for each F (s): (CO3) 10

(a) $\dfrac{10s}{(s+1)(s+2)(s+3)}$

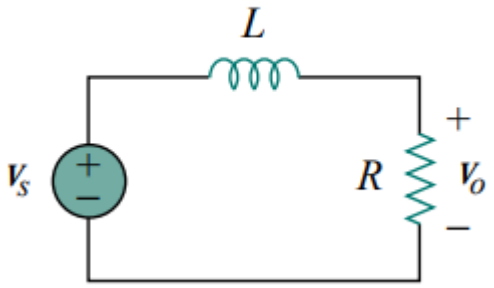
(b) $\dfrac{2s^2+4s+1}{(s+1)(s+2)^3}$

(c) $\dfrac{s+1}{(s+2)(s^2+2s+5)}$

6-b. Explain Impulse response. From the RL circuit in Figure. Find: (CO3) 10

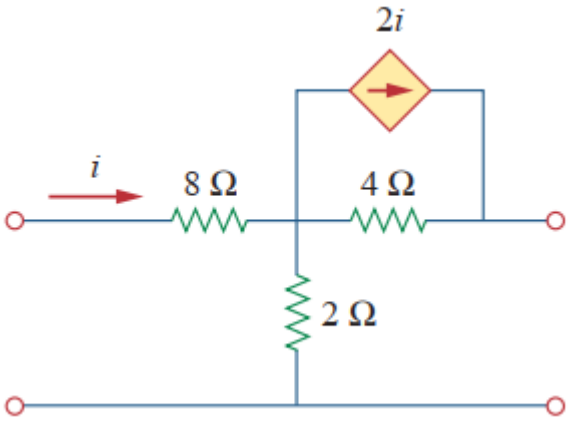
(a) the impulse response h(t) of the circuit

(b) the unit step response of the circuit.

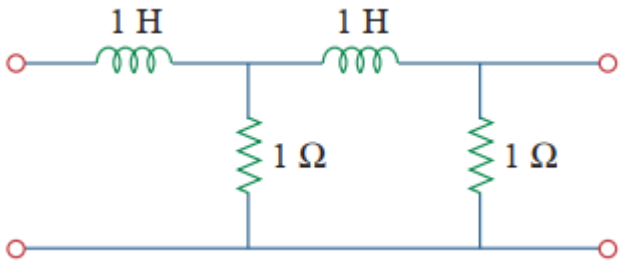


7. Answer any <u>one</u> of the following:-

7-a. Write the equation of ABCD parameters. Determine the ABCD parameters for the two-port shown in Fig. (CO4) 10



7-b. Write the Reciprocity condition in Y and H Parameters.For the ladder network in Fig, determine the Y parameters in the s domain.(CO4) 10



8. Answer any <u>one</u> of the following:-

8-a. Describe the Cauer first and second form.The driving point impedance of an LC network is given by 10

$$Z(s) = \frac{2s^5 + 12s^3 + 16s}{s^4 + 4s^2 + 3}$$

Determine the Cauer - first form of the network (CO5)

8-b. Describe the Foster form of network realization. Realize the network using Cauer's first and second form. (CO5) 10

Z(s)=5(s+1)(s+4)/(s+3)(s+5).