Printed Page:- Subject Code:- AEC0303

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NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA

(An Autonomous Institute Affiliated to AKTU, Lucknow)

B.Tech.

SEM: III - THEORY EXAMINATION (2021 - 2022) (ONLINE)

Subject: Signals, Systems and Networks

Time: 02:00 Hours Max. Marks: 100

General Instructions:

1. *All questions are compulsory. It comprises of two Sections A and B.*

- *Section A - Question No- 1 has 35 objective type questions carrying 2 marks each.*
- *Section B - Question No- 2 has 12 subjective type questions carrying 3 marks each. You have to attempt any 10 out of 12 question.*
- *No sheet should be left blank. Any written material after a Blank sheet will not be evaluated/checked.*

SECTION A 35 x 2 = 70

1. Attempt ALL parts:-

1.1.a Which of the following system is causal system? [ y(t) is output and u(t) is a input step function] 1

(a) y(t) = sin(u(t+3))

(b) y(t) = 5 u(t) +3u(t-1)

(c) y(t) = 5u(t) +3 u(t+1)

(d) y(t) = sin(u(t+3)) + sin(u(t-3))

1.1.b A continuous-time system is governed by the equation $3y^3(t) + 2y^2(t) + y(t) = x^2(t) + x(t)$. y(t) and x(t) respectively are output and input The system is (CO1) 1

(a) linear and dynamic

(b) linear and non-dynamic

(c) non-linear and dynamic

(d) non-linear and non-dynamic

1.1.c If the response of a system to an input does not depend on the future values of the input. Then which one of the following is true for the system? 1

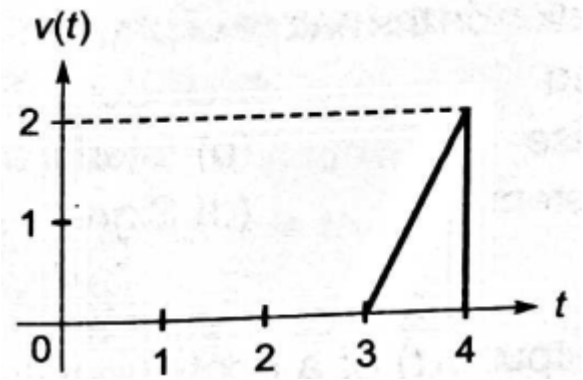
(a) It is aperiodic

(b) It is causal

(c) It is anticipator

(d) It is discrete

1.1.d The graph shown below, which one of the following express v(t)? 1




(a) (2t+6)[u(t-3) + 2u(t-4)]

(b) (-2t+6)[u(t-3) + 2u(t-4)]

(c) (-2t-6)[u(t-3) + 2u(t-4)]

(d) (2t-6)[u(t-3) - 2u(t-4)]

1.1.e Which of the following is the correct statement? 1
The system characterized by the equation y(t) = ax(t) + b is (CO1)

(a) linear for any value of b

(b) linear if b > 0

(c) linear if b < 0

(d) linear if b = 0

1.1.f Double integration of a unit step function would lead to (CO1) 1

(a) an impulse

(b) a parabola

(c) a ramp

(d) a doublet

1.1.g Exponentially damped sinusoidal signal is _____ 1

(a) periodic with period 2n

(b) Periodic with period 2π

(c) Periodic with period 2

(d) Non periodic

1.2.a Impulse response of a system is h(t) = δ(t-0.5). If two such system are cascaded, the impulse response of the overall system will be (CO2) 1

(a) 0.5δ(t-0.25)

(b) δ(t-0.25)

(c) δ(t-1)

(d) 0.5 δ(t-1)

1.2.b The Fourier Transform of a rectangular pulse is ... (CO2) 1

(a) Triangular Pulse

(b) Rectangular Pulse

(c) Sinc function

(d) Impulse function

1.2.c The response of a linear, time invariant system to a unit step is $s(t) = (1-e^{-t/RC})u(t)$ is the unit step. what is the impulse response of this system? 1

(a) $e^{-t/RC}$

(b) $e^{-t/RC}u(t)$

(c) $1/RC\{e^{-t/RC}u(t)\}$

(d) δ(t)

1.2.d A system has impulse response h[n] = cos(n)u[n] The system is 1

(a) Causal and stable

(b) Non causal and stable

(c) Non-causal and not stable

(d) Causal and not stable

1.2.e A continuous time periodic signal x(t), having a period T, is convolved with itself. The resulting signal is 1

(a) periodic having a period T

(b) periodic having a period T/2

(c) periodic having a period 2T

(d) not preodic

1.2.f If a periodic function f(t) of period T satisfies f(t) = -f(t + T/2), then in its Fourier series expansion, 1

(a) the constant term will be zero
(b) there will be no cosine terms
(c) there will be no sine terms
(d) there will be no even harmonics

1.2.g The Fourier transform of u(t) is 1

(a) $1/j\omega$
(b) $j\omega$
(c) $1/(1 + j\omega)$
(d) $1/j\omega + \Pi(\omega)$

1.3.a The variable s in the Laplace transform H (s) is called 1

(a) transfer function
(b) zero
(c) pole
(d) complex frequency

1.3.b If F (s) = 1/(s + 2), then f (t) is 1

(a) $e^{2t}\,u(t)$
(b) $e^{-2t}\,u(t)$
(c) $u(t - 2)$
(d) $u(t + 2)$

1.3.c Find f (t) where 1

$F(s) = e^{-2s}/(s + 1)$,

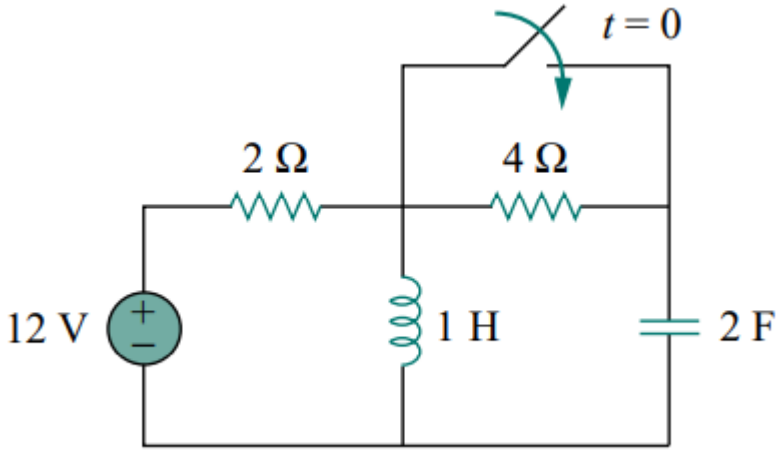
(a) $e^{-2(t-1)}\,u(t - 1)$
(b) $e^{-(t-2)}\,u(t - 2)$
(c) $e^{-(t-2)}\,u(t)$
(d) $e^{-t}\,u(t - 2)$

1.3.d 1

The initial value of f (t) with transform of $F(s) = \dfrac{s+1}{(s+2)(s+3)}$ (CO3)

(a) nonexistent
(b) ∞
(c) 1
(d) 1/6

1.3.e For the circuit in Figure, the initial inductor current (at t = 0) is: 1




(a) 0 A
(b) 2 A
(c) 6 A
(d) 8 A

1.3.f Find the value of x(∞) if 1

$$X(s) = \frac{2s^2+5s+12/s}{s^3+4s^2+14s+20}.$$

]

(a) 5/4
(b) 12/20
(c) 2
(d) 4/5

1.3.g An LTI system have impulse response is function H(s) =1/(s+3) if the input signal is sin 2t. Then the steady state response of the system is 1

(a) 1/8
(b) 0
(c) 8
(d) infinite

1.4.a In two-port networks the parameter g11 is called _____ 1

(a) Short circuit input impedance
(b) Short circuit current ratio
(c) Open circuit voltage ratio
(d) Open circuit input admittance

1.4.b In two-port networks the parameter z11 and z22 are known as (CO4) 1

(a) admitance parameters
(b) Open circuit driving-point impedances
(c) Short-circuit output impedances
(d) Open-circuit transfer impedances

1.4.c Y parameter is also known as _____ 1

(a) admitance parameters
(b) impedance parameters
(c) Transconductance parameter
(d) None of these

1.4.d For the given information Z11 = 3, Z12 = 1, Z21 = 2, Z22 = 1. Find the value of Y11. 1

(a) 1
(b) -1
(c) 2
(d) -2

1.4.e A network is said to be symmetrical if the relation between A and D is? (CO4) 1

(a) A = D
(b) A = C
(c) C =D
(d) B = C

1.4.f For an ideal step down (n :1) transformer, which one of the following is the A parameter? 1

(a) n
(b) 0
(c) 5n
(d) 1/n

1.4.g two port network are connected in cascade. The combination is to be represented as a single two-port network. The parameters of this network are abtained by 1

(a) Z - parameters
(b) Y - parameters
(c) ABCD - parameters
(d) h - parameters

1.5.a The denominator polynomial in a transfer function may not have any missing terms between the highest and the lowest degree, unless? (CO5) 1

(a) all odd terms are missing
(b) all even terms are missing
(c) all even or odd terms are missing
(d) all even and odd terms are missing

1.5.b The roots of the odd and even parts of a Hurwitz polynomial P (s) lie on 1

(a) right half of s plane
(b) left half of s-plane
(c) on jω axis
(d) on σ axis

1.5.c When s is real, the driving point impedance function is _____ function and the driving point admittance function is _____ function. 1

(a) real, complex
(b) real, real
(c) complex, real
(d) complex, complex

1.5.d The poles of a stable should lie in (CO5) 1

(a) Left half of the s-plane including jw axis.
(b) Right half of the s-plane including jw axis
(c) anywhere in s plane
(d) only on positive real axis.

1.5.e The driving point impedance of an LC network is given by $Z(s)=(2s^5+12s^3+16s)/(s^4+4s^2+3)$. By taking the continued fraction expansion using first Cauer form, find the value of $C_2$. 1

(a) 1
(b) 1/2

(c) 1/3

(d) 1/4

1.5.f Consider a function Z(s)=5(s+1)(s+4)/(s+3)(s+5). Find the value of $R_1$. 1

(a) 4/3

(b) 5/3

(c) 3/5

(d) 3/4

1.5.g Consider the impedance function $Y(s)=(s^2+4s+3)/(3s^2+18s+24)$. Find the value of $C_2$ after realizing by second Foster method. 1

(a) 1/16

(b) 1/8

(c) 1/32

(d) 1/64

SECTION B 10 X 3 = 30

2. Answer any TEN of the following:-

2.1.a Consider a continuous-time system with input x(t) and output y(t) related by y(t) = x(sin(t)). Find whether the system is (i) causal or non-causal (ii) Time Variant or Time Invariant 2

2.1.b Determine the value of Power and Energy of the signal $x(n) = (0.5)^n U(n)$ 2

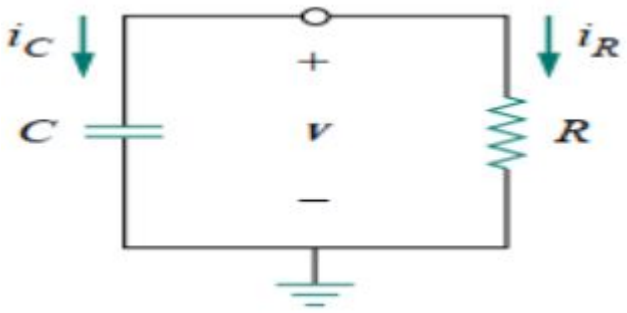
2.2.a compute the convolution $y(t) = x(t) \star h(t)$ of the following pairs of signals: $x(t) = h(t) = u(t)$ 2

2.2.b Explain the duality property of Fourier Transform for continuous time signal. 2

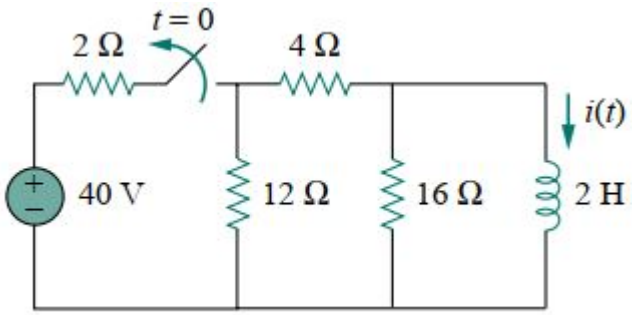
2.2.c Given that x(t) has Fourier Transform X(w) then find the Fourier Transform of $x(1 + t) - 5 x(-1 -t)$. 2

2.3.a State initial value theorem and final value theorem for laplace transform. 2

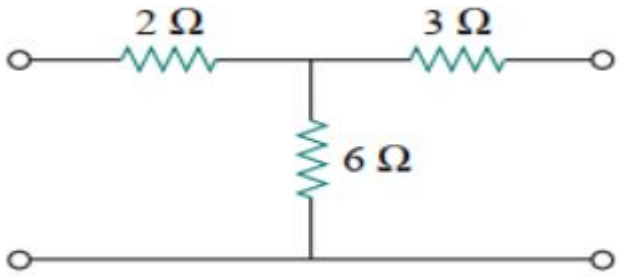
2.3.b Consider a source free RC circuit find voltage across capacitor. Also plot V vs t 2



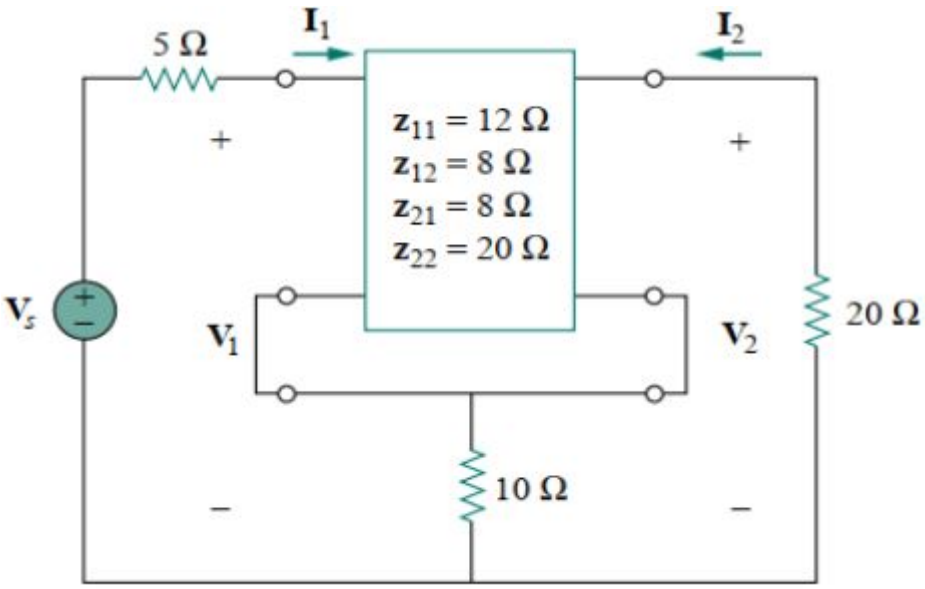

2.3.c The switch in the circuit in the Fig. has been closed for a long time. At t = 0, the switch is opened. Calculate i(t) for t > 0 2




2.4.a Find the hybrid parameters for the two-port network of Fig. 2




2.4.b Evaluate V2/Vs in the circuit in Fig. 2




2.5.a Check whether the polynomial $F(S) = S^4 + S^3 + 2S^2 + 3S + 2$ is Hurwitz polynomial or not. 2

2.5.b Consider the impedance function $Z(s)=(s^2+1)(s^2+3)/(s^2+2s)$. Design Cauer - II ladder network. 2