Printed Pages:02 **Sub Code: REE-303**

Paper Id: 233670 **Roll No.** | | | | | | | | | | |

B-TECH
(SEM III) THEORY EXAMINATION 2022-23
BASIC SIGNAL & SYSTEM

Time: 3 Hours ***Total Marks: 70***

Note: Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1. Attempt *all* questions in brief. 2 x 7 = 14

(a) List properties of unit impulse function.
(b) Determine period of signal x(t)=sin 3t.
(c) Sketch the following Signal x(t)=r(t+1)-r(t)+u(t)-3u(t-1)+u(t+2).
(d) What is Dirichlet condition?
(e) What does ROC signify in Laplace Trasform?
(f) Express the standard form of state space representation.
(g) How z transform is equivalent to DTFT?

SECTION B

2. Attempt any *three* of the following: 7 x 3 = 21

(a) Test the causality and stability of the system

$$y(n) = x(n) - x(-n-1) + x(n-1)$$

(b) State differentiation and time shifting property for Fourier Transform. Derive the same.
(c) A system is described by the differential equation

$$\frac{d^2y(t)}{dt^2} + 5\frac{dy(t)}{dt} + 6y(t) = x(t)$$

Find the impulse response of the system
(d) Obtain the output response of the system described by the following state variable formulation

$$\begin{bmatrix} \dot{x_1} \\ \dot{x_2} \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u(t)$$

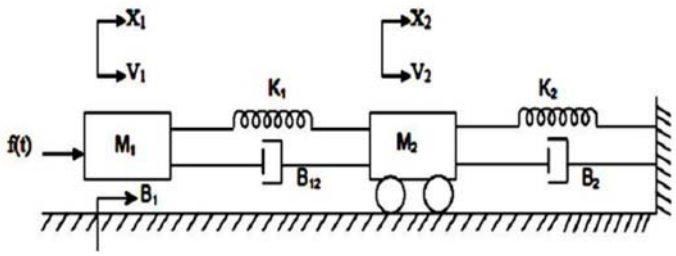
(e) Find the inverse z transform of the signal

$$F(z) = \frac{z^{-1}}{1 - 3z^{-1}}$$

SECTION C

3. Attempt any *one* part of the following: 7 x 1 = 7

(a) Check whether $x(t) = rect(t/C)\ sin\omega_o t$ energy or power signal is, find the energy/ power of the signal.
(b) Draw electrical analogous circuit of the system shown in figure using f-I analogy. Assuming wheel are frictionless



4. Attempt any *one* part of the following: 7 x 1 = 7

(a) Derive the relation between trigonometric Fourier series coefficients and exponential Fourier coefficients. Express the standard form of Fourier series representation (i) Trigonometric form (ii) Exponential form.

(b) Using Fourier transform find the convolution of the signals

$$x_1(t) = te^{-t}u(t) \; and \; x_2(t) = te^{-2t}u(t)$$

5. Attempt any *one* part of the following: 7 x 1 = 7

(a) Verify Initial value theorem for the following function

i) $x(t) = 4 - 2e^{3t}$

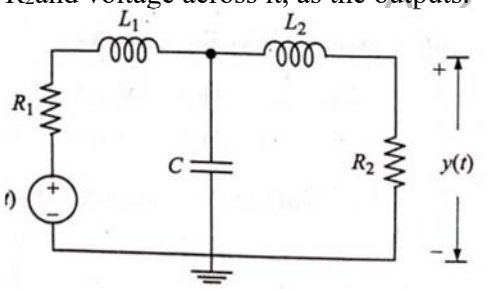
ii) $x(t) = 3e^{-5t}$

(b) Find the inverse Laplace function of

$$X(s) = \frac{s+1}{s^3 + s^2 + 6s + 4}$$

6. Attempt any *one* part of the following: 7 x 1 = 7

(a) Obtain the state-space model for the circuit shown. Consider current through R_2 and voltage across it, as the outputs.



(b) Obtain the space model of the system described by transfer function

$$\frac{Y(s)}{U(s)} = \frac{6(s+3)(s+2.5)}{(s+2)(s^2+4s+5)}$$

7. Attempt any *one* part of the following: 7 x 1 = 7

(a) Find the z transform and ROC of the following function

$$x(n) = a^n u(n) - b^n u(-n-1)$$

(b) Determine x(n) associated with Z transform

$X(z) = \frac{(1/4)z^{-1}}{[1-(1/2)z^{-1}][1-(1/4)z^{-1}]}$, if ROC $|z| > \frac{1}{2}$