

Paper Id: 120303

Roll No:

B. TECH
(SEM III) THEORY EXAMINATION 2019-20
BASIC SIGNALS & SYSTEMS

Time: 3 Hours

Total Marks: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

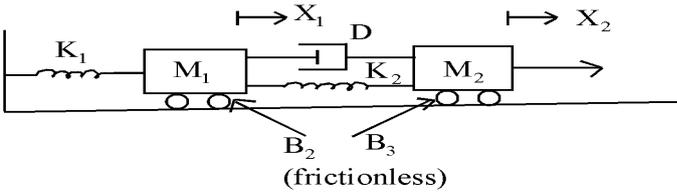
SECTION A

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

a.	Check the signal $y(t) = x(\sin(t))$ is causal or not
b.	Explain Force-Voltage Analogy with suitable example?
c.	Define following terms- state vector, state space
d.	Find initial value of following function- $F(s) = \frac{s + 1}{(s + 2)(s + 3)}$
e.	Explain frequency scaling property in fourier transform.
f.	Determine the transfer function for the system described by the difference equation - $y(n) - y(n-1) = x(n) - x(n-2)$.
g.	Enlist the properties of the ROC in Z transform.

SECTION B

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

a.	<p>Write the equivalent mathematical system for the system shown in fig. Also draw the force-voltage analogous circuit of this.</p>  <p style="text-align: center;">(frictionless)</p>
b.	<p>Find Inverse Laplace transform: (i)</p> $H(s) = \frac{4}{(s + 1)(s + 3)}$ <p>(ii)</p> $D(s) = \frac{10s}{(s^2 + 1)(s^2 + 4)}$
c.	<p>Find Fourier Transform of following signal:</p> <p>(i) $f(t) = e^{-3t} \sin(10t) u(t)$</p> <p>(ii) $g(t) = 20 / (4 + t^2)$</p>

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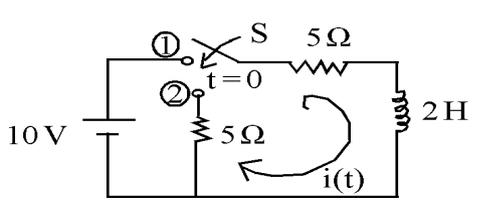
d.	Find the Z Transform of following function- $x(n) = 2^n u(n) + 3^n u(n-1)$ And depict the ROC.
e.	Explain the concept of state space equations. A system is describe by following differential equation , obtain state space representation of the system, $\frac{d^2v(t)}{dt^2} + 6\frac{dv(t)}{dt} + 8v(t) = 2u(t)$

SECTION C

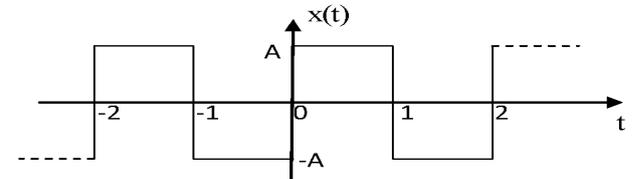
3. Attempt any one part of the following: 7 x 1 = 7

(a)	Sketch the following signals: (i) $f(t) = r(t+2) - r(t) - r(t-2)$ (ii) $f(t) = u(t) + 5u(t-1) - 2u(t-2)$
(b)	1. Check following function is periodic or not, if periodic find period- (i) $f(t) = \cos \pi t + 2 \cos 3\pi t + 3 \cos 5\pi t$ 2. Check if the following function is linear or not (i) $Y(t) = x(\sin(t))$

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

(a)	For the circuit shown in fig , find the current $i(t)$ when switch is at position 2. The switch S is moved from position 1 to position 2 at $t = 0$. Initially switch S is at position 1 for a long time. 
(b)	Find Laplace transform of the following function using laplace properties- i. $r(2t)$ ii. $e^{-at} \sin(\omega t)u(t)$

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

(a)	Obtain the trigonometric Fourier series for the waveform shown in fig. 
(b)	Find fourier transform of following function- $f(t) = A \text{sinc}(t/2\pi)$

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6. Attempt any *one* part of the following:

7 x 1 = 7

(a)	State and prove, the following properties of Z- transform. i. Time scaling ii. Time shifting iii. Differentiation
(b)	Find the signal x(n) from of following function- $X(z) = \log(1+az^{-1}) \quad z > a $

7. Attempt any *one* part of the following:

7 x 1 = 7

(a)	i. Write advantages of state space analysis. ii. What is state transition matrix, write down its properties.
(b)	A state- model of the system is given by $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} [u]$ $Y = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ <p>Find the transfer function $\frac{Y(S)}{X(S)}$. Find the state transition matrix. Find the state equation for a unit step input under zero initial conditions.</p>