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 required any missing data, then choose suitably.

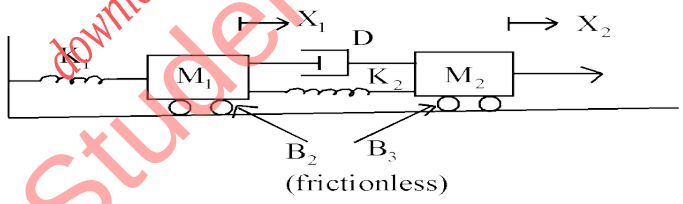
SECTION A

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

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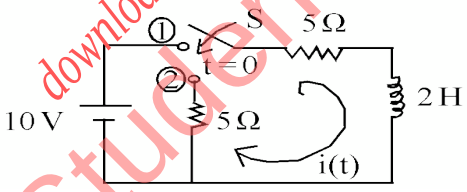
d.	Find the Z Transform of following function- $x(n) = 2^n u(n) + 3^n u(n-1)$ And depict the ROC.
e.	Explain the concept of state space equations. A system is describe by following differential equation , obtain state space representation of the system, $\frac{d^2v(t)}{dt^2} + 6\frac{dv(t)}{dt} + 8v(t)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

SECTION C

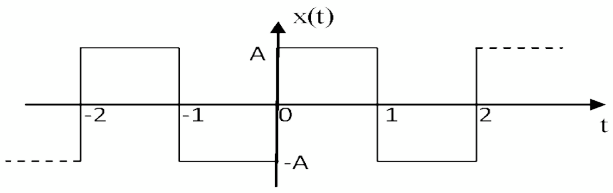
3. Attempt any *one* part of the following: 7 x 1 = 7

(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 πt + 2 cos 3πt +3 cos 5πt 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 trnasform of the following function using laplace properties– i. r(2t) ii. e^{-at} sin(wt)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 sinc (t/ 2π)

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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 $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} [u]$ $\quad Y= \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}$ 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.