Sub Code:KEE303

Paper Id: 120323 Roll No:

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

Time: 3 Hours *Total Marks: 100*

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

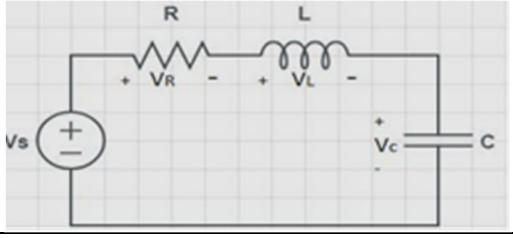
SECTION A

1. Attempt *all* questions in brief. 2 x 10 = 20

Qno.	Question	Marks	CO
a.	Define signal. What are various types of signals?	2	1
b.	Differentiate between Invertible and Non-Invertible system.	2	1
c.	State and explain sampling theorem.	2	2
d.	State and prove time shifting property of Fourier Series.	2	2
e.	Deduce inverse laplace transform of 1/s(s+4).	2	3
f.	Drive Laplace transform of sinωt.	2	3
g.	What is the significance of state variable?	2	4
h.	What is the condition for the stability of a system?	2	4
i.	Drive time reversal property of z-transform.	2	5
j.	Find the z transform of $f(nT) = e^{-anT}$; $a>0$, $n \geq 0$	2	5

SECTION B

2. Attempt any *three* of the following: 10X3=30

Qno.	Question	Marks	CO
a.	find even and odd component of the following signals (i) x(t)= cost + sint + cost sint (ii) x(n) = {1,2,1,4,5,0,3}	10	1
b.	Obtain the trigonometric Fourier series for the half wave rectified sine wave.	10	2
c.	Calculate the Laplace transform for the function $F(t) = e^{-at}$ sinhbt.	10	3
d.	Obtain the state model for the electric network shown in figure. Select i_L and Vc as state variables. 	10	4
e.	State and prove the time delay theorem and Parsavel's theorem of Z-transform.	10	5

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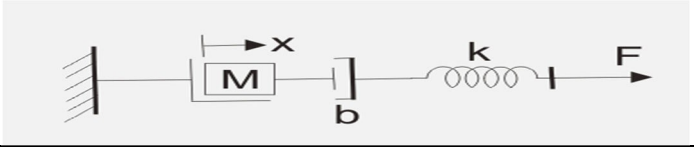
SECTION C

3. Attempt any *one* part of the following: 10X1=10

Qno.	Question	Marks	CO
a.	Sketch the function (i) x(t)=u(t)+2u(t)+3u(t-4)-u(t-5) (ii) x(t)= r(t+1)-r(t)+r(t-2)	10	1
b.	Obtain F-V and F-I analogous system of mechanical system shown in figure. 	10	1

4. Attempt any *one* part of the following: 10X1=10

Qno.	Question	Marks	CO
a.	Explain the trigonometric and exponential form of Fourier series representation of periodic signal. Find the Fourier transform of given signal shown in fig.	10	2
b.	State and prove duality property of Fourier transform. Find the inverse fourier transform of $X(j\omega) = \begin{cases} 2\cos\omega, & \lvert\omega\rvert \le \pi \\ 0, & \lvert\omega\rvert > \pi \end{cases}$	10	2

5. Attempt any *one* part of the following: 10X1=10

Qno.	Question	Marks	CO
a.	For a transfer function H (s) = (s+10)/(s^2 + 3s + 2). Find the response due to input x (t) = Sin2(t) u (t).	10	3
b.	Find the inverse Laplace transform of given function by using convolution theorem (i) $x(s)= 1/(s^2+a^2)^2$ (ii) x(s)= s/(s+1)(s+2)	10	3

6. Attempt any *one* part of the following: 10X1=10

Qno.	Question	Marks	CO
a.	Consider the state equation shown below. $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -2 & -3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 0 \\ 1 \end{bmatrix} u$ Determine the state transition equation x(t) when the input is unit step and $x_1(0)= 1$, $x_2(0)= 2$.	10	4
b.	Explain state transition matrix, its physicalsignificance and properties.	10	4

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7. Attempt any *one* part of the following: 10X1=10

Qno.	Question	Marks	CO
a.	State and prove time shifting property of Z-transform. Also find the inverse Z-transform of given function using convolution theorem. $x_1(z) = \frac{1}{1-az^{-1}}, ROC : [z] > [a]$ $x_2(z) = \frac{1}{1-z^{-1}}, ROC : [z] > [1]$	10	5
b.	For the discrete system described by the difference equation y(n) = 0. 6y(n-1)-0.08y(n-2)+x(n). Determine: (i)The unit sample response sequence, h(n), (ii)The step response.	10	5