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.
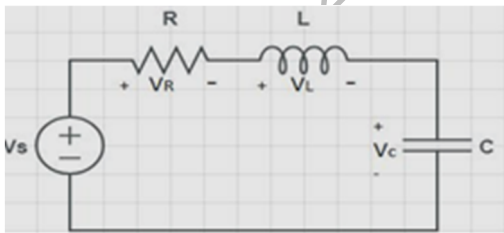
SECTION A

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

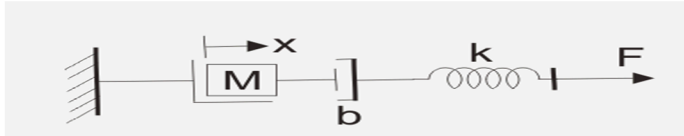| Qno.	Question	Marks	CO
a.	Define signal. What are various types of signals?	2	1
b.	Differentiate between Invertible and Non-Invertible system.	2	1
c.	State and explain sampling theorem.	2	2
d.	State and prove time shifting property of Fourier Series.	2	2
e.	Deduce inverse laplace transform of $1/s(s+4)$.	2	3
f.	Drive Laplace transform of $\sin\omega t$.	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) $x(t)= \cos t + \sin t + \cos t \sin t$ (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 $F(t) = e^{-at} \sinh bt$.	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

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, $X(j\omega) = \begin{cases} 2\cos\omega, & |\omega| < \pi \\ 0, & |\omega| > \pi \end{cases}$	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)/(s² + 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/(s²+a²)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

Paper Id: | 120323 | **Roll No:** | | | | | | | | | | | |

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