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BTECH
(SEM III) THEORY EXAMINATION 2023-24
BASIC SIGNALS & SYSTEMS

TIME: 3HRS

M.MARKS: 100

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

SECTION A

1. Attempt all questions in brief.

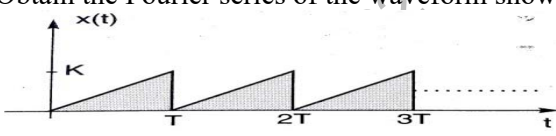
2 x 7 = 14

Q no.	Question	Marks	CO
a.	Classify different types of signals?	2	1
b.	Briefly explain power signal and energy signal.	2	1
c.	Explain effect of symmetry on Fourier series.	2	2
d.	Find Fourier transform of the given signal $x(t) = e^{-at}$.	2	2
e.	Explain Time shifting property of Laplace transform.	2	3
f.	Explain bilateral and unilateral Laplace transform.	2	3
g.	What are the properties of state transition matrix?	2	4
h.	What do you mean by state of a system? Explain state variables.	2	4
i.	Determine z transform and ROC of following signal. $x[n] = 2\delta[n+2] + 3\delta[n] - 5\delta[n-1] + 3\delta[n-2]$	2	5
j.	Give the definition of Z transform? And explain unilateral and bilateral Z transform.	2	5

SECTION B

2. Attempt any three of the following:

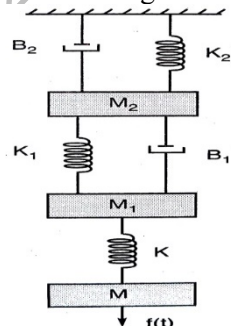
7 x 3 = 21

a.	What do you mean by system? Classify different types of system.	7	1
b.	Obtain the Fourier series of the waveform shown in figure. 	7	2
c.	State and prove differentiation and integration property of Laplace transform.	7	3
d.	Using state variable approach establish the relation between transfer function of a system and state variables.	7	4
e.	Explain Initial and final value theorem for Z transform.	7	5

SECTION C

3. Attempt any one part of the following:

7 x 1 = 7

a.	What do you mean by even and odd signal? And show that the sum of two even and two odd functions is even function and odd function respectively.	7	1
b.	Write the differentiation equations for the translational system shown and in figure and draw its electrical equivalent circuit using F-V analogy. 	7	1



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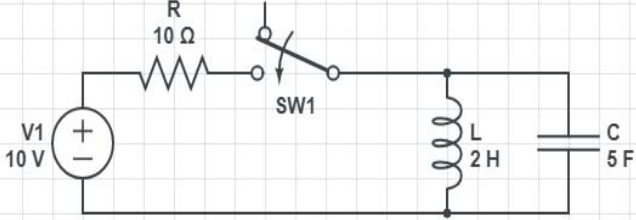
4. Attempt any one part of the following:

7 x 1 = 7

a.	Consider a causal LTI system with frequency response, $H(\omega) = \frac{1}{j\omega+2}$, for a particular input $x(t)$ this system is observed to produce the output. $y(t) = e^{-3t} u(t) - e^{-2t} u(t)$ Determine $x(t)$.	7	2
b.	State and prove time shifting and differentiation property of fourier transform.	7	2

5. Attempt any one part of the following:

7 x 1 = 7

a.	Initially switch is closed for a long time and steady state condition has reached. At $t=0$ switch is opened. Find the expression of current through inductor. 	7	3
b.	Find the inverse Laplace transform of the given function. $F(s) = \frac{-3}{(s+2)(s-1)}$	7	3

6. Attempt any one part of the following:

7 x 1 = 7

a.	Obtain the transfer function for a system having state model. $\begin{bmatrix} \dot{x}_1 \\ \dot{x}_2 \end{bmatrix} = \begin{bmatrix} -4 & -6 \\ 8 & 4 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 6 \\ 10 \end{bmatrix} u$ $y = [1 \ 1] \begin{bmatrix} x_1 \\ x_2 \end{bmatrix}, \quad D = 0$	7	4
b.	What is the significance of State transition matrix? Explain its properties in detail.	7	4

7. Attempt any one part of the following:

7 x 1 = 7

a.	What do you mean by ROC? Explain its properties for the Z transform. And determine ROC for infinite duration Causal sequence.	7	5
b.	Determine inverse Z transform of the given function using Partial fraction method. $X(z) = \frac{3}{1-5z^{-1}+0.5z^{-2}} \text{ for ROC } Z > 1$	7	5