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BTECH
(SEM III) THEORY EXAMINATION 2024-25
BASIC SIGNALS & SYSTEMS

TIME: 3 HRS

M.MARKS: 100

Note: Attempt all Sections. In case of any missing data; choose suitably.

SECTION A

1. Attempt all questions in brief.

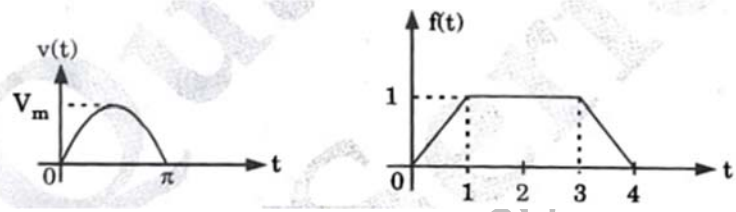
2 x 10 = 20

Q no.	Question	CO	Level
a.	State about Causal and non-causal systems?	1	K1
b.	Compute the value of $\int e^{-5t} \cdot \delta(t-3) dt$.	1	K2
c.	Differentiate between Fourier series and Fourier transform expansion.	2	K2
d.	Write the Laplace transform of system: $F(t) = u(t-3) + u(t+7)$	2	K1
e.	Compute the Laplace transform of $e^{-3t} \cos t$.	3	K2
f.	Differentiate Laplace transform and Z transform.	3	K2
g.	Differentiate between homogeneous and non-homogeneous equation in state model.	4	K2
h.	Express state variables in state space analysis.	4	K3
i.	Explain unilateral and bilateral Z-transform.	5	K2
j.	Describe ROC in Z transform.	5	K2

SECTION B

2. Attempt any three of the following:

10 x 3 = 30

Q no.	Question	CO	Level
a.	Express the given waveforms using standard signals 	1	K3
b.	Explain the linearity, time reversal, time shifting, conjugation and frequency shifting properties of Fourier series expansions.	2	K2
c.	Compute the transfer function of a system whose poles are at $-0.3 \pm j 0.5$ and zeros at -0.1 and $0.2 \pm j 0.6$?	3	K2
d.	Derive transfer function for the state space model.	4	K3
e.	Calculate the unit impulse response sequence, $h(n)$ of signal $y(n) = 0.6 y(n-1) - 0.08 y(n-2) + x(n)$	5	K3

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SECTION C

3. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Explain the following system with examples: i. Linear and non linear ii. Static and dynamic iii. Stable and unstable iv. Causal and anti-causal v. Time variant and Time invariant	1	K2
b.	Compute the power of signal $x(t) = A \sin \omega t$	1	K2

4. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Illustrate the trigonometric and exponential Fourier series in detail.	2	K3
b.	Calculate the CTFS coefficients for the following signal. $X(t) = 5 + \cos(6t + \pi/4) + \sin(8t + \pi/4)$	2	K3

5. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Express the Conjugation, time shifting, multiplication in time, frequency shifting and final value properties of Laplace transform.	3	K3
b.	Examine the unit step response of the system given by $h(t) = (1/RC). e^{-t/RC} u(t)$	3	K3

6. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Express state transition matrix with proof and give significance of all its properties.	4	K3
b.	Construct a state model for a system characterized by the differential equation: $d^3y/dt^3 + 6 d^2y/dt^2 + 11 dy/dt + 6y + u = 0$	4	K3

7. Attempt any one part of the following: 10 x 1 = 10

Q no.	Question	CO	Level
a.	Explain final value theorem with its proof for Z-transform.	5	K4
b.	Examine the Z transform of signal $x[n] = -a^n u(-n-1)$	5	K4