# CBCS SCHEME



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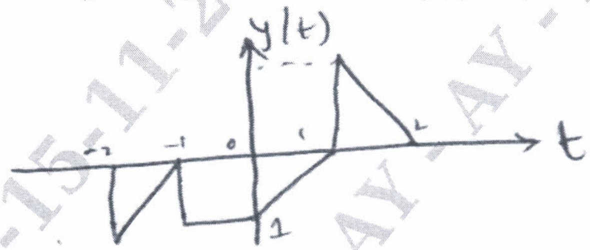
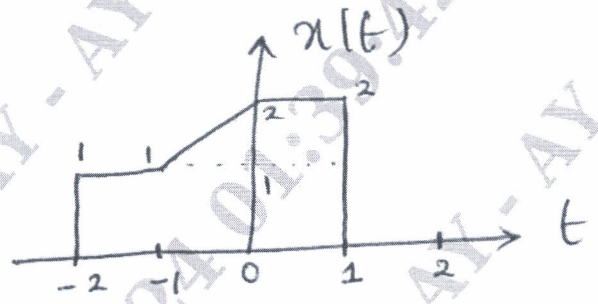
BMT306B

## Third Semester B.E./B.Tech. Degree Supplementary Examination, June/July 2024

## Signals & Systems

Time: 3 hrs. Max. Marks: 100

*Note: 1. Answer any FIVE full questions, choosing ONE full question from each module.*
*2. M : Marks , L: Bloom's level , C: Course outcomes.*

| | | Module – 1 | M | L | C |
|---|---|---|---|---|---|
| Q.1 | a. | Find even and odd parts of the signal $x(n) = \{-1, \underset{\uparrow}{2}, 3, 1, -3\}$ | 10 | L2 | CO1 |
| | b. | Perform time shifting, scaling and reflection on $y(t) = x(-2t+1)$.   Fig. Q1 (b) | 10 | L2 | CO1 |
| | | **OR** | | | |
| Q.2 | a. | Find if the following system is linear, time invariant, memory, casual and stable $y(n) = x(n-5) + x(n-7)$ | 10 | L2 | CO1 |
| | b. | Find even and odd part of the signal.   Fig. Q2 (b) | 10 | L2 | CO1 |
| | | **Module – 2** | | | |
| Q.3 | a. | Find the convolution sum of two sequence $x_1(n)$ and $x_2(n)$, $x_1(n) = \{\underset{\uparrow}{1}, 2, 3\}$, $x_2(n) = \{\underset{\uparrow}{2}, 1, 4\}$ | 10 | L2 | CO2 |
| | b. | Prove commulative property and distributive property of a system. | 10 | L2 | CO2 |
| | | **OR** | | | |
| Q.4 | a. | An LTI system is characterized by a response $h(n) = \left(\frac{3}{4}\right)^n u(n)$, find the step response of the system. | 10 | L2 | CO2 |
| | b. | Convolute the continuous time signal. $x_1(t) = e^{-2t}u(t)$; $x_2(t) = u(t+2)$ | 10 | L2 | CO2 |

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| | | **Module – 3** | | | |
| **Q.5** | **a.** | Find the natural response of the system, $\frac{d^2y(t)}{dt^2}+2\frac{dy(t)}{dt}+y(t)=\frac{dx(t)}{dt}$ Given $y(0)=1$, $\frac{dy^{n}(t)}{dt}=1$ | 10 | L3 | CO3 |
| | **b.** | Draw direct form I and II for the system, $y(n)+\frac{1}{4}y(n-1)-\frac{1}{8}y(n-2)=2x(n)+3x(n-1)$ | 10 | L3 | CO3 |
| | | **OR** | | | |
| **Q.6** | **a.** | Compute the response of the system, $y(n)-\frac{1}{9}y(n-2)=x(n-1)$ Given $y(-1)=1$, $y(-2)=0$, $x(n)=u(n)$ | 10 | L3 | CO3 |
| | **b.** | Compute response of the system, $\frac{d^2y(t)}{dt^2}+5\frac{dy(t)}{dt}+4y(t)=\frac{dx(t)}{dt}$ $y(0)=0,\ y'(0)=1,\ x(t)=e^{-2t}u(t)$ | 10 | L3 | CO3 |
| | | **Module – 4** | | | |
| **Q.7** | **a.** | Derive linearity and time shifting for continuous time Fourier series. | 10 | L2 | CO4 |
| | **b.** | For the signal $x(t)=\sin\omega_0 t$ find the Fourier series and its spectrum. | 10 | L3 | CO4 |
| | | **OR** | | | |
| **Q.8** | **a.** | Derive Parseval's theorem. | 10 | L2 | CO4 |
| | **b.** | Find the complex Fourier co-efficient of x(t), $x(t)=\frac{1}{4}+\sum_{n=1}^{4}\left[\frac{1}{n^2}\cos\left(\frac{nt}{5}\right)+\frac{(-1)^n}{(2n+1)^2}\sin\left(\frac{nt}{5}\right)\right]$ | 10 | L3 | CO4 |
| | | **Module – 5** | | | |
| **Q.9** | **a.** | Derive frequency shift and scaling for continuous time Fourier transforms. | 10 | L2 | CO5 |
| | **b.** | Derive time differentiation and modulation for continuous time Fourier transforms. | 10 | L2 | CO5 |
| | | **OR** | | | |
| **Q.10** | **a.** | Obtain Fourier transforms of signal $e^{-at}.u(t)$ and plot magnitude and phase spectrum. | 10 | L2 | CO5 |
| | **b.** | Obtain Fourier transform of, (i) $x(t)=e^{at}.u(-t)$ (ii) $x(t)=e^{-a\|t\|}$ | 10 | L2 | CO5 |

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