

21/05/2025 SE EXTC SEM-IV C-SCHEME SS QP CODE: 10083524

Duration: 3hrs

[Max Marks:80]

N.B. : (1) Question No 1 is Compulsory.

(2) Attempt any three questions out of the remaining five.

- 1 Attempt any FOUR [20]
 - a Find the fundamental period of the signal $x(t)=3\cos 4\pi t+2\sin 8\pi t$ [05]
 - b Compare energy and power signal [05]
 - c Find the initial value and final value of the Laplace transform $X(s) = \frac{7s+6}{s(3s+5)}$ [05]
 - d Find the Z-transform of $x[n]= 0.5^n u[n]$. [05]
 - e Using duality property, find out the Fourier transform of $\delta(t)$ [05]
- 2 a Obtain the Fourier transform of a rectangular pulse with duration T and amplitude A in the interval $-\frac{T}{2} < t < \frac{T}{2}$ [10]
 - b $x[n] = \{1, 1, 1, 1, 2\}$. Sketch $x[n-2]$, $x[-n]$, $x[-3-n]$, $x[2n]$, $x[\frac{n}{2}]$. [10]

Underline in $x[n]$ shows origin.
- 3 a Find the inverse Laplace transform of $X(s)=\frac{2}{s(s+2)(s+4)}$ for all possible ROCs. [10]
 - b Test the given systems for Linearity, Causality, Stability, Memory and Time Invariant [10]
 - i. $Y(t)=x(t^2)$
 - ii. $Y(n)=x(-n)$
- 4 a Find $x[n]$ using partial fraction method from the given function $X(Z) = \frac{z-4}{(z-1)(z-2)^2}$ [10]
 - b Find the convolution of given two signals $x_1(t) = e^{-2t}u(t)$ and $x_2(t) = e^{-5t}u(t)$. [10]
- 5 a Find the transfer function $H(z)$ and impulse response $h[n]$ of a discrete time system with I/O relation $y(n) - 3y(n-1) - 4y(n-2) = x[n] + 2x[n-1]$ [10]
 - b Realize the given IIR system using Direct form I and Direct Form II. [10]

$$H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{(z - \frac{1}{4})(z^2 - z + \frac{1}{2})}$$
- 6 Explain any two [05]
 - i. Properties of Laplace Transform [10]
 - ii. Sampling theorem for lowpass Signals
 - iii. FIR Filters and Linear phase Filters
