Model Question Paper

Fifth Semester B.E.(CBCS) Examination
Signals and Systems

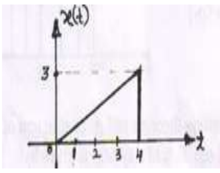
(Common to all Branches)

Time: 3 Hrs Max.Marks: 80

Note: Answer any FIVE full questions, choosing at least ONE question from each module

Module-I

1. a. Distinguish between i) Even and Odd Signals
ii) Periodic and nonperiodic signals **(04 Marks)**
b. Determine whether the following signals are periodic, if periodic determine the fundamental period. i) $x(t) = \cos 2t + \sin 3t$ ii) $x[n] = \sin 2n$ **(04 Marks)**
c. Sketch the following signal for x(t) is shown in figure.
i) x(3t+2) ii) x(2(t+2) iii) x(-2t-1) iv) x(-2t+3) **(08 Marks)**



2. a. Find total energy of the following signals
i) $x(t) = A$; $-T/2 < t < T/2$ ii) $x(t) = \begin{cases} \frac{1}{2}[\cos(\omega t) + 1] & \frac{-\pi}{\omega} \le t \le \pi/\omega \\ 0 & \text{otherwise} \end{cases}$ **(08 Marks)**
$= 0$; Otherwise
b. Determine whether the system $y(t) = x(n^2)$ is i) Linear ii) Time-invarient
iii) Memory iv) Causal v) Stable **(08 Marks)**

Module-II

3. a. Consider an LTI system with input x(n) & unit impulse response h(n) given below, Compute y(n). $x(n) = 2^n u(-n)$; & $h(n) = u(n)$ **(08 Marks)**
b. Find the step response for the LTI system represented by impulse response
i) $h(n) = u(n)$ ii) $h(n) = (1/2)^n u(n)$ **(4 Marks)**
c. . Determine stability & causality of the following
i) $h(n) = (1/2)^n u(n)$ ii) $h(t) = e^{-3t} u(t-1)$ **(4 Marks)**

4. a. Find Forced response of the following system given by
$y(n) - 5/6\, y(n-1) + 1/6\, y(n-2) = x(n)$ where $x(n) = 2^n$ (**10 Marks**)
b**.** Draw direct form-I & II structures for the system described by the differential equation**.** **(6 marks)**

$$\frac{d^3y(t)}{dt^3} + \frac{2dy(t)}{dt} + 3y(t) = x(t) + \frac{3dx(t)}{dt}$$

Module-III

5. State & prove the following properties of FT. i) Time shifting property ii) parseval's theorem. **(10Marks)**

   b. Obtain the fourier transform of $x(t) = te^{-at}u(t)$ **(6 Marks)**

6. a. Find the fourier transform of rectangular pulse shown below

   $x(\omega) = 1/(a+j\omega)^2$ **(08 Marks)**

   b. Find the frequency response & impulse response of the system described by differential equation. **(08 Marks)**

   $dy(t)/dt + 8y(t) = x(t)$

Module-IV

7. a. Obtain the DTFT of the signal $x[n] = 2^n u(-n)$ **(06 Marks)**

   b. State & prove the following properties of DTFT. i) Convolution property ii) Frequency differentiation. **(10Marks)**

8. a. Using DTFT find the total solution to the difference equation for discrete time signal. $5y(n+2) - 6y(n+1) + y(n) = 0.8\, u(n)$ **(08 Marks)**

   b. Find the fourier transform of the following.

   $x(n) = 1 \quad ; -2 \le n \le 2$ **(08 Marks)**

   $\quad = 0 \quad ;$ Otherwise

Module-V

9. a. Find the Z-transform of the following

   i) $x(n) = 2^n u(-n-1)$ ii) $x(n) = (3)2^n u(-n)$ **(08 Marks)**

   b. Prove the following properties of Z-transform i) Linearity ii) Initial value theorem

   (08 Marks)

10. a. Find Inverse Z-transform of the following using partial fraction expansion method.

    $X(z) = (1+2z^{-1}+z^{-2})/(1-1.5z^{-1}+0.5z^{-2})$ **(08 Marks)**

    b. Solve the following difference equation using unilateral Z-transform

    $Y(n) + 3y(n-1) = x(n)$ with $x(n) = u(n)$ and the initial condition $y(-1) = 1$

    (08 Marks)