CBCS SCHEME

USN | | | | | | | | | | |

15MT73

Seventh Semester B.E. Degree Examination, Feb./Mar. 2022
Signal Process

Time: 3 hrs. Max. Marks: 80

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define signal. List the types of signals with an example for each. **(08 Marks)**

b. Find the even and odd component of the signals given below :

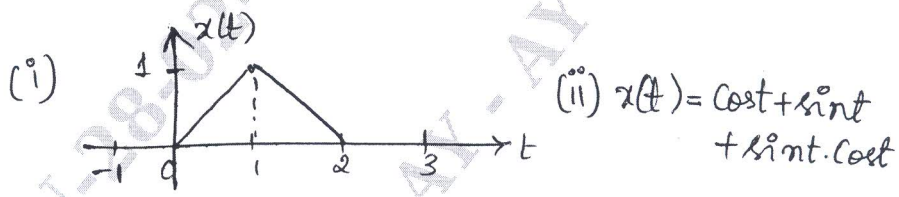

Fig.Q1(b) **(08 Marks)**

OR

2 a. Check whether the system is memoryless casual, time invariant, linear and stable.
i) $y(t) = x(t) + 10$
ii) $y(n) = x(n) + n$. **(08 Marks)**

b. For $x(n) = \{\frac{1}{2}, 1, 2, 4, 8\}$ sketch
i) $y_1(n) = x(n - 3)$
ii) $y_2(n) = x(-n + 4)$. **(08 Marks)**

Module-2

3 a. Determine the convolution of
$x(n) = \{1, 5, 4, 3, 2\}$
$h(n) = \{1, 0, 1, 0, 2\}$. **(08 Marks)**

b. State and prove the property of commutation and distribution in convolution. **(08 Marks)**

OR

4 a. Derive an expression for convolution sum. **(08 Marks)**

b. Evaluate $x(n) = (\frac{1}{2})^n u(n)$ and $h(n) = u(n - 3)$. **(08 Marks)**

Module-3

5 a. State and prove Parseval's theorem. **(08 Marks)**

b. Compute and DFT of $x(n) = \{0, 1, 2, 3\}$. **(08 Marks)**

OR

6 a. In direct computation of N-point DFT of x(n). How many :
i) Complex multiplication
ii) Complex additions
iii) Trigonometric functions are required
iv) Real multiplications are required. **(08 Marks)**

b. Compute circular convolution of
$x(n) = [1\ \ 2\ \ 3\ \ 4]$
$h(n) = [1\ \ 0\ \ 1\ \ 0]$. **(08 Marks)**

Module-4

7 a. Derive an expression for order of a Butterworth low pass filter. **(08 Marks)**

b. Obtain direct form I, direct from II and parallel realization of

$$H(z) = \frac{8z^3 - 4z^2 + 11z - 2}{(z - \frac{1}{4})(z^2 - z + \frac{1}{2})}.$$ **(08 Marks)**

OR

8 a. Design a Chebysheve I filter to meet the following specification,
Pass bound ripple ≤ 2dB
pass band edge 1rad/sec
stop band alternation ≥ 20dB and stopband edge – 1.3rad/sec. **(08 Marks)**

b. A digital low pass filter is required to meet the following specification :
i) Monotonic passband and stopband
ii) –3.01dB cutoff frequency of 0.5π rad
iii) Stopband alternation of atleast 15dB at 0.75π rad. Find the system function H(z) using bilinear transformation. **(08 Marks)**

Module-5

9 a. Realize FIR linear phase filter for 'N' to be even. **(08 Marks)**

b. A low pass filter is to be designed with frequency response

$$H_d(w) = H_d(e^{jw}) = \begin{cases} e^{-j2w}, & |w| < \pi/4 \\ 0, & \pi/4 < w < \pi \end{cases}$$

Determine $h_d(n)$ and h(n) if w(n) is a rectangular window defined below :

$$w_R(n) = \begin{cases} 1, & 0 \le n \le 4 \\ 0, & \text{otherwise} \end{cases}.$$ **(08 Marks)**

OR

10 a. Obtain direct form I, direct form II cascade realization for,
$y(n) = 0.75y(n-1) - 0.125y(n-2) + 6x(n) + 7x(n-1) + x(n-2)$. **(08 Marks)**

b. Design a low pass filter with a cut off frequency $w_C = \pi/4$, a transition width $\Delta w = 0.02\pi$ and a stopband ripple $\delta_S = 0.01$. Use Kaiser window. **(08 Marks)**

* * * * *