QP Code:RD21BTECH293 | Reg. No | | | | | | | | | | | AY 21

# GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester Regular) Examinations, December – 2023

## 21BEEPC35003/21BELPC35003– Signals and Systems

(EEE & EE)

Time: 3 hrs | Maximum: 70 Marks

**(The figures in the right hand margin indicate marks)**

**PART – A** **(2 x 5 = 10 Marks)**

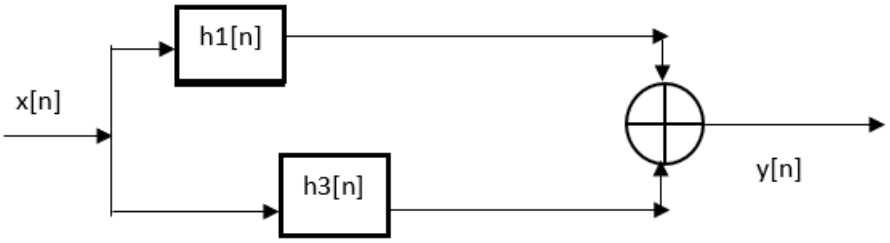
Q.1. Answer ***ALL*** questions

| | | CO # | Blooms Level |
|---|---|---|---|
| a. | Two discrete time signals are represented by:<br>$x_1[n] = \{2,2,\underset{\uparrow}{2},2\}$<br>$x_2[n] = \{\underset{\uparrow}{1},1,-1,1\}$<br>Find $x_1 \times x_2$ | CO1 | K1 |
| b. | Represent $x[n] = \delta[n] + \delta[n-1] + \delta[n+2]$ in sequential and tabular form. | CO1 | K1 |
| c. | Check whether the following system is causal and non-causal.<br>$y[n] = x[n] + \frac{1}{x[n+1]}$ | CO2 | K2 |
| d. | Differentiate between linear convolution and circular convolution. | CO3 | K1 |
| e. | Find the z-transform and ROC for x[n] = {2, -2, 2, 3, 6} | CO4 | K2 |

**PART – B** **(15 x 4 = 60 Marks)**

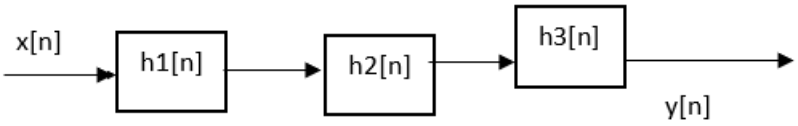
Answer ***ALL*** questions

| | | Marks | CO # | Blooms Level |
|---|---|---|---|---|
| 2. a. | Determine whether the following signal is periodic or not? If periodic find the periodicity.<br>$x[n] = \sin\left(\left(\frac{3\pi n}{4}\right) + 1\right)$ | 8 | CO1 | K2 |
| b. | Define unit step, unit ramp, and unit impulse discrete time systems. Represent them in graphical form. | 7 | CO1 | K1 |
| | (OR) | | | |
| c. | Two discrete time signals are represented by:<br>$x_1[n] = \{2,1,\underset{\uparrow}{2},1,-2\}$<br>$x_2[n] = \{\underset{\uparrow}{1},1,1,1,2\}$<br>Find $(i)2x_1 + 3x_2$ *and* $(ii)3x_1 - 7x_2$ | 8 | CO1 | K2 |
| d. | Find the even and odd parts of the signal $x[n] = 4^n$. | 7 | CO1 | K1 |
| 3.a. | Check the stability of following systems.<br>(i) $y[n] = \frac{1}{x[n+1]}$<br>(ii) $y[n] = \delta[n] + x[n+1]$ | 7 | CO2 | K1 |
| b. | As shown in the figure find y[n] if,<br>$x[n] = \{1,-1,1,111\}, h_1[n] = \{2,-1,0,1\}, h_2[n] = \{3,-1,1,1\}$ | 8 | CO2 | K1 |




(OR)

| | | | | | |
|---|---|---|---|---|---|
| c. | Determine whether the following systems are time-invariant or time variant.<br>(i) y[n] = x[n] + x[n-1]<br>(ii) y[n] = ax[n]+x[-n] | 7 | CO2 | K1 |
| d. | As shown in the figure find y[n] if,<br>$x[n] = \{-1,-1,1\}, h_1[n] = \{2,-1,0\}, h_2[n] = h_3[n] = \{2,2,1\}$ | 8 | CO2 | K1 |




| | | | | |
|---|---|---|---|---|
| 4.a. | Find the natural response of following discrete time system:<br>y[n]+3y[n-1]+2y[n-2] = x[n]+x[n-2] with initial conditions y[-1] = 1, y[-2] = 1 | 7 | CO3 | K1 |
| b. | An LTI system y[n]+ 5y[n-1] +6y[n-2] = 2x[n-1] +x[n-1]. Find the natural response with initial conditions y[-1] = y[-2] = 1. | 8 | CO3 | K1 |
| | (OR) | | | |
| c. | Find the unit step response of the following difference equation:<br>y[n]+12y[n-1]+36y[n-2] = x[n]+x[n-1] with the initial conditions y[0]=4 and y[1] = 2. | 7 | CO3 | K1 |
| d. | Given two discrete time sequences:<br>$x_1[n] = \{1,-1,1\}\ and\ x_2[n] = \{1,2,2\}$<br>Find the circular convolution of the two sequences. | 8 | CO3 | K1 |
| 5.a. | Find the inverse z-transform of<br>$X(z) = \frac{z(z^2+7z+10)}{(z-1)(z-3)(z-9)}$ using partial fraction method. | 7 | CO4 | K1 |
| b. | Find the impulse response of the following system described by the difference equation: y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1) using z-transform method. | 8 | CO4 | K1 |
| | (OR) | | | |
| c. | Find the z-transform of the sequence $x[n] = na^n u[n]$ | 7 | CO4 | K1 |
| d. | Determine the unit step response of the following system described by the difference equation: y(n) – 0.7y(n-1) + 0.12y(n-2) = x(n-1) + x(n-2) using z-transform method. | 8 | CO4 | K2 |

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