QPC: RD20BTECH383 AR 20 Reg. No

GIET UNIVERSITY, GUNUPUR – 765022

B. Tech (Fifth Semester – Regular) Examinations, December – 2022

BPCEL5030 / BPCEE5030 – Signals and Systems

(EE / EEE)

Time: 3 hrs Maximum: 70 Marks

Answer ALL Questions

The figures in the right hand margin indicate marks.

PART – A: (Multiple Choice Questions) **(1 x 10 = 10 Marks)**

Q.1. Answer ***ALL*** questions [CO#] [PO#]

a. Choose the correct equation for finding the output of a discrete time convolution? CO3 PO3

(i) $y[n] = \sum x[k]h[n-k]$, k from 0 to ∞ (ii) y[n] = ∑x[k]h[n-k], k from -∞ to +∞

(iii) $y[n] = \sum x[k]h[k]$, k from 0 to ∞ (iv) $y[n] = \sum x[k]h[n]$, k from -∞ to +∞

b. Signal is a _____ CO1 PO3

(i) Time variant (ii) It is a physical phenomenon

(iii) Conveys information (iv) All of the above

c. The region of convergence _____ CO4 PO1

(i) Decides whether the system is variable or stable (ii) Decides whether the sequence is non-causal or causal

(iii) Both a and b (iv) None of the above

d. _____ function gives measure of match or similarity or coherence between a signal and its time shifted version CO3 PO2

(i) Cross-correlation (ii) Auto-correlation

(iii) Auto or cross-correlation (iv) None of the above

e. The signal is said to be even when it satisfies the condition _____ CO1 PO2

(i) $x(t) = x(t)$ (ii) $x(t) = x(2t)$

(iii) $x(t) = x(-t)$ (iv) $x(t) = -x(-t)$

f. The system output y(t)=x(t),if t=0 then the output is dependent on _____ CO2 PO2

(i) Present input (ii) Past input

(iii) Both a and b (iv) None of the above

g. If a sequence is purely right-sided sequence or causal then region of convergence is entire z-plane except at _____ CO4 PO2

(i) z is equal to 0 (ii) z is equal to ∞

(iii) z is equal to 0 and z is equal to ∞ (iv) None of the above

h. if $x[n] = \{2, 1, 2, 1\}$ then $x[n-3]$ is CO1 PO2

(i) {0, 0, 0, 2, 1, 2, 1} (ii) {0, 0, 2, 1, 2, 1}

(iii) {0, 2, 1, 2, 1} (iv) {0, 0, 0, 0, 2, 1, 2, 1}

i. Find the Z-transform of δ(n+3). CO4 PO3

(i) Z (ii) Z^2

(iii) 1 (iv) Z^3

j. Which of the following systems is time invariant? CO2 PO2

(i) $y(t) = x(2t) + x(t)$ (ii) $y(t) = x(t) + x(1-t)$

(iii) $y(t) = -x(t) + x(1-t)$ (iv) $y(t) = x(t) + x(t-1)$

PART – B: (Short Answer Questions) **(2 x 10 = 20 Marks)**

Q.2. Answer ***ALL*** questions	[CO#]	[PO#]
a. Find the transfer function H(Z) when $y(n) = \frac{1}{2}y(n-1) + 3x(n)$	CO4	PO2
b. Find whether the following signals are energy or power	CO1	PO2
i. $x(n) = \delta(n)$ and		
ii. $x(n) = 2sin(200\pi t)$		
c. Find whether the following systems are static or dynamic	CO2	PO2
i. $y(n) = x(n-2) + x(n)$		
ii. $y(n) = 2x(n) - x(n-1)$		
d. Define Inverse Z-transform	CO4	PO3
e. What is meant by impulse response of any system?	CO3	PO3
f. Draw the block diagram for the following operation $2y[n] - 4x[n] = y[n-1] - 2x[n-1]$	CO2	PO3
g. Find the Z-transform of $x(n) = -u(-n-1)$	CO4	PO3
h. Find whether the following signals are periodic or non-periodic	CO1	PO1
i. $x(n) = Cos3\pi n$ and		
ii. $x(n) = Cos\pi/3t + Sin\pi/4t$		
i. What are the conditions for a system to be LTI system?	CO3	PO2
j. What are the three elementary operations in block diagram representation of discrete time system?	CO2	PO2

PART – C: (Long Answer Questions) **(10 x 4 = 40 Marks)**

Answer ***ALL*** questions	Marks	[CO#]	[PO#]
3. a. Check whether the following systems are linear or not	5	CO2	PO2
i. $y(n) = n^2x(n)$			
ii. $y(n) = x(n)Cos\omega n$			
iii. $y(n) = x(n) + 1/2x(n-2)$			
b. Prove $Z\{nx(n)\} = -Z\frac{dX(Z)}{dz}$	5	CO4	PO3
(OR)			
c. Find the convolution of the following signals	5	CO3	PO3
i. $x(n) = \{2,-5,9,8,5,4\}$ *and* $y(n) = \{1,3,-6,8,0,-3\}$			
ii. $x(n) = \{2,1,2,1\}$ *and* $y(n) = \{1,2,3,4\}$			
d. Find whether the following signals are energy or power	5	CO1	PO2
i. $x(n) = -4Cos(\pi n)$			
ii. $x(n) = u(n) - u(n-10)$			
4. a. Find out the transfer function H(Z) for the following	5	CO4	PO3
i. $h(n) = \{1,-1,2,4,3,5\}$			
ii. $4y(n) - 3y(n-2) = 5x(n) - 2x(n-2)$			
b. Check whether the following systems are stable or not	5	CO3	PO2
i. $h(n) = e^{2n}u(n-1)$			
ii. $h(n) = 2^n u(-n)$			

(OR)

c.	Find the Inverse Z-transform of the following signal using long division methods $$X(z) = \frac{3z^2 - 2z + 1}{z^2 - 3z + 2}$$	10	CO4	PO2
5. a.	Find whether the following systems are causal or non-causal system i. $y(t) = x^2(t) + x(t - 3)$ ii. $y(t) = x(3 - t) + x(t - 2)$ iii. $y(n) = x(2n)$ iv. $y(n) = \sin[x(n)]$	5	CO2	PO2
b.	Find the Z-transform using the properties of Z-transform (i). $x(n) = u(n-5)$ (ii). $x(-n) = u(-n)$ (iii). $x(n) = n.u(n)$ (iv). $x(n) = 6^n u(n)$	5	CO4	PO3

(OR)

c.	$x(n) = \{1,4,-2,0,-3,-1,6,-5,7\}$ where -3 is the origin. Find $x(-n-5)$, $x(n-4)$, $u_r(-n+6)$, $\delta(-n+2)$, $u(-n-4)$	5	CO1	PO2
d.	Find whether the following are LTI system or not $y(n) = 2x(-n) + 5x^2(n)$ and $y(n) = n^2 x(n^2)$	5	CO3	PO2
6. a.	Express the following discrete time sequence in terms of impulse signal i. $x(n) = \{1,5,8,9,3,6\}$ Express the impulse signal in terms of discrete time sequence i. $y(n) = 5\delta(n) + 6\delta(n-3) + 8\delta(n+1) - 4\delta(n-6) + 9\delta(n+2)$	5	CO2	PO3
b.	Given $x_1(n) = \{1,3,5,7,9\}$ and $x_2(n) = \{2,4,6,8,0\}$. Find $x_1(n) + x_2(n)$, $x_1(n) * x_2(n)$, $2x_1(n) + \delta(n+3)$, $u(n) + u(n+3)$ and $u_r(n+5) + 3x_2(n)$	5	CO1	PO3

(OR)

c.	Find the auto correlation of $x(n) = 3\delta(n+3) - 4\delta(n) - 2\delta(n-4)$	10	CO3	PO2

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