GUJARAT TECHNOLOGICAL UNIVERSITY
BE - SEMESTER–VII (NEW) EXAMINATION – SUMMER 2024

Subject Code:2171708   **Date:28-05-2024**
Subject Name:Digital Signal Processing
Time:02:30 PM TO 05:00 PM   **Total Marks:70**
Instructions:
1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Draw & discuss typical block diagram of Digital Signal Processing	**03**
	(b)	Mention sampling theorem and explain its importance with suitable	**04**
	(c)	Check the time variance and linearity of given systems.	**07**
		1 . $y(n) = x(n) \cos w_0 n$ 2. $y(n) = x(n) u(n)$	

Q.2	**(a)**	Decide whether system *$y(n) = m\,x(n) + c$* is linear or nonlinear.	**03**
	(b)	Explain bilinear transformation method.	**04**
	(c)	Classify signals and explain all types of signals in brief.	**07**
		OR	
	(c)	Perform the circular convolution of two sequence **$x1(n) = \{1,3,5,3\}$ and $x2(n) = \{2,3,1,1\}$**	**07**

Q.3	**(a)**	State and explain initial and final value theorem in Z transformation.	**03**
	(b)	Derive the Z transformation for $x(n) = a^n (\sin w_0 n) u(n)$	**04**
	(c)	Determine zero input response of system described by homogeneous second order difference equation **$y(n) - 3\,y(n-1) - 4\,y(n-2) = 0.$**	**07**
		OR	
Q.3	**(a)**	Determine causality of the given systems.	**03**
		1. $x(n) = x(n-5)$ 2. $x(n) = x(n+5)$ 3. $x(n) = x(-n)$	
	(b)	Determine Z transformation of Signal **$x(n) = n\,a^n\,u(n)$**	**04**
	(c)	List out the properties of Z transformation with suitable detail	**07**

Q.4	**(a)**	What is aliasing effect and how it can be eliminated?	**03**
	(b)	ROC of Z-transform and enlist properties of ROC.	**04**
	(c)	Find circular convolution of the sequences **$x(n)=\{1,2,3,4\}$ and $h(n)=\{2,1,2,1\}$.**	**07**
		OR	
Q.4	**(a)**	Explain impulse invariance method.	**03**
	(b)	Determine auto-correlation of the following signal: **$x(n) = \{1 ,2, 1, 1\}$**	**04**
	(c)	Enumerate 8 point decimation in time FFT algorithm.	**07**

Q.5	**(a)**	Explain time reversal of a sequence in DFT.	**03**
	(b)	Calculate 4 point DFT of **$X(n)=\{0,1,2,3\}$**	**04**
	(c)	Explain windowing Method for FIR filter design in brief.	**07**
		OR	
Q.5	**(a)**	Determine the IDFT of **$X[k] = \{2, 1+j, 0, 1-j\}$**	**03**
	(b)	Derive and explain symmetry properties for DTFT.	**04**
	(c)	Explain in brief about impulse invariance method for IIR filter design.	**07**

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