Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII(OLD) • EXAMINATION – WINTER 2016

Subject Code: 171003 Date: 23/11/2016

Subject Name: Digital Signal Processing

Time: 10:30 AM to 01:00 PM Total Marks: 70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** Attempt following questions. **06**

1) Draw the basic block diagram of Digital Signal Processor and explain each blocks in brief.
2) Compare and contrast between DTFT and DFT.

(b) Classify the following systems. **08**

1) Causal Vs non causal systems
2) Recursive Vs non recursive systems
3) Linear Vs non linear systems
4) Stable Vs unstable systems

Q.2 **(a)** Determine the causality and stability of given discrete time sequences. **06**

1) $h(n) = (1/2)^n u(n)$
2) $h(n) = n\, u(-n+2)$

(b) Determine impulse response of following LTI systems described by their constant coefficient difference equation. **08**

$y(n) = 2\, x(n) – x(n-2) + 0.7\, y(n-1) -0.1\, y(n-2)$

OR

(b) Discuss in detail practical applications of Convolution and Correlation in communication and signal processing. **07**

Q.3 **(a)** Discuss any three properties of Z-Transform in detail with proof. **06**

(b) Describe the properties of ROC in context with Z-Transform and determine the Z-Transform of given signal. **08**

$x(n) = u(n) – u(n-10)$

OR

Q.3 **(a)** Explain Harvard architecture for Digital Signal Processor with their key features in detail. **07**

(b) Find out the inverse Z-Transform of given sequence when **07**

ROC $|z| > 1$ and also for ROC $|z| < 0.5$

$X(z) = (1 - 1.5z^{-1} + 0.5\, z^{-2})^{-1}$

Q.4 **(a)** Derive and prove the validity of the following statement: **07**

"Multiplication of two DFTs results into Circular Convolution in time domain."

(b) Obtain direct form I & II, cascade and parallel form structures for the given system **07**

$y(n) = ½\, y(n-1) + ¼\, y(n-2) + x(n) + x(n-1)$

OR

Q.4 **(a)** Starting with DTFT spectra, derive the equation of DFT and also explain how any discrete signal can be recovered from obtained DFT spectra. **07**

(b) Compute 4 point DFT of a given discrete sequence using Radix-2 DIT FFT algorithm. **07**

$x(n) = \{ 4, 3, 2, 1 \}$

Q.5	**(a)**	Explain Radix 2 DIF FFT algorithm for computing 8 point DFT. Derive all necessary equations and signify importance of bit reversal table in it.	**07**
	(b)	Why ideal filters are practically not realizable? Explain the condition of causality and also describe how practical filters can be implemented?	**07**

OR

Q.5	**(a)**	Explain with derivation Impulse Invariance approach for implementing digital IIR filter. State some limitations of this approach and also briefly discuss solution to overcome such limitations.	**07**
	(b)	In order to compute N point DFT, how FFT algorithms are considered significantly efficient in contrast with traditional DFT approach? Under which set of parameters comparison between these algorithms are possible? Comment on efficiency of FFT against DFT.	**07**

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