Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

ME- SEMESTER II– EXAMINATION – SUMMER 2015

Subject Code: 2724707 **Date: 01/06/2015**

Subject Name: Mechatronics Signal Processing

Time: 2:30 PM – 5:00 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 Explain the adaptive filters and LMS algorithm for coefficient updating. **07**

B Explain the envelope analysis of signal with suitable example. **07**

Q:2 A Describe the various properties of DFT. **07**

B What do you understand by discrete time systems? Discuss the following discrete time systems: **07**

1. Linear and nonlinear system
2. Causal and non-causal system
3. Time variant and time invariant system

OR

Q:2 B The input sequence $x(n) = \{\underset{\uparrow}{3},1,2,-1\}$ is applied to a discrete time processor with unit sample response $h(n) = \{\underset{\uparrow}{3},2,1\}$. What is the result output sequence of then processor? **07**

Q:3 A Differentiate the following systems using Z transform: **07**

1. Left-sided sequences
2. Right-sided sequences
3. Two-sided sequences
4. Finite duration sequences

B State and explain properties of Z transform. **07**

OR

Q:3 A Find x(n) if **07**

(a) $X(Z) = \dfrac{1}{1-5Z^{-1}}$, if ROC $|Z| > 5$

(b) $X(Z) = \dfrac{1}{1-5Z^{-1}}$, if ROC $|Z| < 5$

	B	Causal system produces an output sequence $y(n) = \delta(n) + \frac{2}{5}\delta(n-1)$ for the input $x(n) = \delta(n) - \frac{7}{10}\delta(n-1) + \frac{1}{10}\delta(n-2)$. Determine the impulse response of the system and also the input and output of the equation.	**07**
Q:4		For the sequence $x(n) = \delta(n) + 2\delta(n-2) + \delta(n-3)$ (a) Find the four point DFT of x(n) (b) If y(n) is four point circular convolution of x(n) with itself, find y(n) and four point DFT Y(m)	**14**

OR

Q:4		What is FFT algorithm? Draw the basic butterfly diagram and derive the general expression for outputs of the butterfly structure for 8 points DFT.	**14**
Q:5		Explain FIR filters and various methods to design FIR filters with suitable example.	**14**

OR

Q:5	**A**	The time domain difference equation of IIR filter is given by y(n) = 0.0605• x(n)+ 0.121• x(n-1)+ 0.0605• x(n-2) +1.194• y(n-1)- 0.436• y(n-2) Analyze this filter for stability.	**07**
	B	Explain the sampling of lowpass signal with suitable example.	**07**

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