Student Exam No._____

GANPAT UNIVERSITY

B. TECH. SEMESTER VI (ELECTRICAL ENGINEERING)

REGULAR EXAMINATION APRIL – JUNE 2015

2EE613: DIGITAL SIGNAL PROCESSING

Time: 3 Hours **Total Marks: 70**

Instruction:
1. All questions are compulsory.
2. Answers to two sections must be written in separate answer books.
3. Figures to the right indicate full marks.
4. Assume suitable data if necessary.

SECTION - I

Que-1

(A) A discrete time signal $x(n) = \{1, 1, 1, 1, 0.5, 0.5\}$ Find and draw sketch of following signal **[06]**

(1) $x(n-2)$, (2) $x(-n)$, (3) $x(2-n)$.

(B) Draw the examples of **[06]**

(i) Causal and Anticausal signal,

(ii) Periodic & Aperiodic signal and

(iii) Even & Odd signal.

OR

Que-1

(A) Explain the various methods of representing discrete-time signal with examples **[06]**

(B) Explain the time shifting and folding operations on discrete time signals **[06]**

Que-2

(A) Find Inverse Z-transform using partial faction method: **[06]**

$$X(z) = \frac{3z^2 + 2z + 1}{z^2 + 4z + 3}$$

(B) Check linearity and causality of following systems. **[05]**

(1) $y(n) = n * x(n)$

(2) $y(n) = x(n^2)$

OR

Que-2

(A) Find Z-transform: **[06]**

$$x(n) = \sin \omega n$$

(B) Define ROC for right sided discrete time signals. **[05]**

Que-3

(A) Prove that the complex convolution operation of two signals in time domain changes into simple multiplication operation in Z domain through Z- transform. **[04]**

(B) Obtain direct form I and direct form II realization of a discrete time system represented by differential equation. **[06]**

$$y(n) = 9y(n-1) - 11y(n-2) + 24y(n-3) + 2x(n) - 4x(n-1) + 11x(n-2) - 8x(n-3)$$

(C) Explain Sampling Theorem. **[02]**

SECTION – II

Que-4

(A) Compute circular convolution of the following two sequences using graphical method. **[06]**

$$x_1(n) = \{1, 3, 5, 7\}, x_2(n) = \{0, 2, 4, 6\}$$
$$\uparrow \qquad\qquad \uparrow$$

(B) Find impulse response of LTI system if input sequence $x(n) = \{1, -1\}$ and desired output $y(n) = \{1, 0, 0, 0, 1\}$. **[06]**

OR

Que-4

(A) Determine DTFT of the sequence $x(n) = \left(\frac{1}{2}\right)^n u(n-2)$, using time shifting and linearity property. **[06]**

(B) The following signals are sampled at rate of 40 Hz. Find out corresponding discrete time signal and also make necessary comment on result. **[06]**

(1) $x_1(t) = \cos 2\pi(10)t$
(2) $x_2(t) = \cos 2\pi(50)t$
(3) $x_3(t) = \cos 2\pi(90)t$

Que-5

(A) Write down steps and expression for designing low pass FIR filter using Window Method. **[07]**

(B) Compare DSP Processors with ordinary micro-processors. **[04]**

OR

Que-5

(A) Determine the frequency response (Magnitude and Phase Functions) of First Order Discrete Time System using DTFT. **[06]**

(B) Draw practical specification of lowpass and highpass filters and explain all the terms. **[05]**

Que-6

(A) Design a FIR lowpass filter with cutoff frequency 1.5 kHz and sampling frequency 5 kHz with 7 samples using Fourier Series Method (FSM). & draw direct form I structure of the digital filter. **[10]**

(B) List out some finite word length effects in digital filters. **[02]**

END OF PAPER