Student Exam No._____

GANPAT UNIVERSITY

B. Tech. Semester: VI (Electrical) Engineering

Regular / Remedial Examination April – June 2016

2EE613: Digital Signal Processing

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

Instruction:
1. Assume suitable data if necessary.
2. Figures to right indicate full marks.
3. This Question paper has two sections. Attempt each section in separate answer book.
4. Be precise and to the point in answering the descriptive questions.

SECTION : I

Que.1

(A) Investigate whether systems shown below are linear/ nonlinear, time dependent/independent, and causal/non causal. **[06]**

1) $y(n) = n\,x(n)$
2) $y(n) = \cos[x(n)]$

(B) Perform linear convolution of following sequences by mathematical equation method. **[06]**

$x(n) = \{1, \underset{\uparrow}{2}, 1, 2\}, \quad h(n) = \{1, \underset{\uparrow}{1}, 1\}$

OR

Que.1

(A) Explain the given systems with respect to (i) time invariance (ii) linearity properties. **[06]**

1) $y(n) = \sum_{k=-\infty}^{n} X(k)$
2) $y(n) = sgn\,[x(n)]$
3) $y(n) = Trunc[x(n)]$

(B) Find the linear convolution of sequences shown below by tabular method. **[04]**

$x(n) = \{1, 1, 1\}, \; h(n) = \{1, 1, 1\}$

(C) What is ROC? Define the ROC for finite length right sided signal. **[02]**

Que.2

(A) Derive the magnitude and phase spectrum of frequency response for first order discrete time system $y(n) = x(n) + a\,y(n-1)$ using DTFT. **[06]**

(B) Find the z – transform: $x(n) = n^2 + 4n + 3 \quad for\ n \geq 0$ **[05]**

OR

Que.2

(A) Obtain the impulse response $h(n)$ of the system using z-transform. **[06]**

$$y(n) - 3\,y(n-1) + 2\,y(n-2) = 3\,x(n) + 2\,x(n-1) + x(n-2)$$

(B) Compute the DTFT of the following sequence. **[05]**

$$x(n) = a^{|n|} \quad ; -1 \leq n \leq 1$$

Que.3 **Attempt following questions.**

(A) Compare: IIR filter with FIR filter **[03]**

(B) Draw direct form I & direct form II structure realization of the IIR systems. **[07]**

$$y(n) + \frac{3}{8}y(n-1) - \frac{1}{64}y(n-3) = x(n) + 3x(n-1) + 2x(n-2)$$

(C) What do you mean by twiddle factor? Explain. **[02]**

SECTION : II

Que.4

(A) Explain the various methods of representing discrete time signals with examples. **[05]**

(B) State & Explain sampling theorem in details. **[05]**

(C) What is Nyquist rate of sampling? Explain its significance. **[02]**

OR

Que.4

(A) Draw the examples of (i) Continuous & Discrete time signals (ii) periodic & aperiodic signal and (iii) Even and odd signals. **[05]**

(B) Discrete time signal is given by $x(n) = \{1, 2, \underset{\uparrow}{3}, -2, -1, 0, 1, 4\}$ Find; **[05]**

(i) $x(n+3)$ (ii) $x(-n)$ (iii) $x(-n+2)$ (iv) $x(2n+3)$ (v) $x\left(\frac{n}{2}\right)$

(C) Draw the characteristic of low pass Butterworth filter. **[02]**

Que.5

(A) Write down the steps and expressions for designing IIR lowpass digital Butterworth filter. **[06]**

(B) Compute the 4 – point IDFT of the sequence $X(K) = \{2,\ 1-j,\ 0,\ 1+j\}$ **[05]**

OR

Que.5

(A) For Hanning window & Hamming window give function representation, time domain & Magnitude response of it. **[06]**

(B) In detail explain gibbs phenomenon. **[05]**

Que.6 **Attempt following questions**

(A) Evaluate the convolution of the following sequences using 4-point DFT & IDFT. **[06]**

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

(B) Explain the application of DSP in speech recognition. **[06]**

END OF PAPER