SVKM's NMIMS

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT & ENGINEERING

Programme: B. Tech (COMP) Year: III Semester: V
Batch: 2014-15

Academic Year: 2014-2015

Subject: **Digital Signal Processing**

Date: 09/06/2015

Marks: 60
Time: 10.00 am to 1.00 pm
Durations: 3 (hrs)

Re-Examination

Instruction: Candidates should read carefully the instructions printed on the question paper and on the cover of the Answer Book, which is provided for their use.

NB:
1) Question No. one is compulsory.
2) Out of remaining questions, attempt any four questions.
3) In all five questions to be attempted.
4) All questions carry equal marks.
5) Answer to each new question to be started on a fresh page.
6) Figures in brackets on the right hand side indicate full marks.

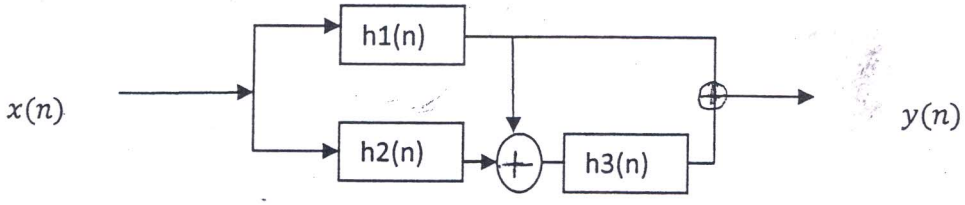
Q1 Attempt any four questions 12

a) Explain the advantages of digital signal processing
b) Explain the effect of aliasing in frequency spectrum
c) Given that, $x(n) = \sin\left(\frac{n}{9} - \pi\right)$ determine whether the following signals are periodic or not
d) Explain the time shifting property of one sided Z.Transform
e) Explain the multiplication property of discrete Fourier transform
f) Obtain the direct form-II realization of LTI system governed by the equation

$$y(n) = -\frac{3}{8}y(n-1) + \frac{3}{32}y(n-2) + \frac{1}{64}y(n-3) + x(n) + 3x(n-1) + 2x(n-2)$$

Q 2: a) Determine the overall impulse response of interconnected discrete time systems shown below 6

$h_1(n) = \left(\frac{1}{3}\right)^n u(n)$ $h_2(n) = \left(\frac{1}{2}\right)^n u(n)$ $h_3(n) = \left(\frac{1}{5}\right)^n u(n)$



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Q 2 b) Explain energy and power signal ? Determine whether the signal $x(n) = \left(\frac{1}{4}\right)^n u(n)$ is power and energy 6

Q 3 a) Determine the impulse response of discrete time LTI system defined by 6

$$y(n) - 4y(n-1) + 4y(n-2) = x(n) - 5x(n-3)$$

Q 3 b) Test the stability of system governed by the difference equation $y(n) = x(n) + by(n-1)$, where $|b| < 1$. 6

Q 4 a) Compute circular convolution of following two sequences using DFT. $x_1(n) = \{0, \quad 1, \quad 0, \quad 1\}$ and $x_2(n) = \{1, \quad 2, \quad 1, \quad 2\}$. 6

b) State the properties of twiddle factor and explain their use to compute the twiddle factor matrix for N=4. 6

Q 5 a) Calculate the percentage saving in calculations in a 512-point radix-2 FFT, when compared to direct DFT. 6

b) In an LTI system the input . $x_1(n) = \{1, \quad 2, \quad 3\}$ and impulse response $x_2(n) = \{-1, \quad -1\}$ determine the response of LTI system by radix 2 DIT-FFT. 6

Q 6 a) Discuss the frequency sampling method for FIR filter design. 6

b) Show the pole locations of a normalized Butterworth filter of a third order, and hence derive the transfer in a polynomial form. 6

Q 7 a) Design an analog low-pass filter for the following specifications using Butterworth type for pass band attenuation: 0.25 dB, and frequency up to which pass band gain must remain more or less steady: 1000 rad/sec and stop band attenuation 15 dB, stop-band edge frequency 14000 rad/sec. 6

Q 7 b) Design an FIR filter to meet the following specifications: Pass-band edge 2 KHz and stop-band edge : 5 kHz . Stop-band edge is 42 dB and sampling frequency is 20 kHz . 6