22145

M. Tech. 1st Sem. Electronics & Communication Engg. Examination–May, 2015

ADVANCED DIGITAL SIGNAL PROCESSING

Paper : MEEC-507

Time : 3 hours   **Max. Marks : 100**

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

Note : Attempt any **five** questions. All questions carry equal marks.

1. (a) Show that the necessary and sufficient condition for LTI System to be stable is   (10)

   $$\sum_{n=-\infty}^{\infty} |h(n)| \leq \infty$$ where h(n) is impulse response

(b) Explain the following terms w.r.t system (10)

    (i) Causality

    (ii) Linearity

    (iii) Time Invariant

2. (a) Find the fourier transform of $x(n) = a^n \sin w_o n \, u(n)$ (8)

(b) State the sampling theorem. For any signal how the sampling rate is selected ? Also discuss that if sampling is performed at minimum sampling rate how reconstruction is done ? (12)

3. (a) Determine the z-transform and ROC of signal

$x(n) = [3(2^n) - 4(3^n]4(n)$ (10)

(b) Explain the properties of DFT. (10)

4. Given that x(n) = [1,2,3,4,4,3,2,1], find x(k) using DIF FFT algorithm. (20)

5. Explain in detail various window functions for FIR filter Design. (20)

6. (a) Design a single pole low pass filter with 6dB bandwidth of 0.2π using the bilinear transformation applied to analog filter.

(15)

$$H(s)=\frac{\Omega c}{s+\Omega c}$$

Where Ωc is the 3dB bandwidth of analog filter.

(b) Compare between analog and Digital filters. (05)

7. (a) Draw the structures of cascade and parallel realization of (12)

$$H(z) = \frac{\left(1 - z^{-1}\right)^3}{\left(1 - \frac{1}{2}z^{-1}\right)\left(1 - \frac{1}{8}z^{-1}\right)}$$

(b) Discuss the effect of finite word length in digital filter. (08)

8. Write short notes on :

(a) Phase Equalizer (10)

(b) Digital Frequency Transformation (10)

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