

Roll No.

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)

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

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

(i) Causality

(ii) Linearity

(iii) Time Invariant

2. (a) Find the fourier transform of $x(n) = a^n \sin \omega_0 n u(n)$ (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

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

(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 Ω_c 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)

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

- (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)