Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VIII • EXAMINATION – SUMMER • 2015

Subject Code:183203 **Date:05/05/2015**

Subject Name: Digital Signal Processing and Processor

Time:10.30AM-01.00PM **Total Marks: 70**

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**

Q.1 **(a)** (i) Explain the concept of sampling and aliasing in sampled data system. **07**
(ii) Explain the symmetry property of the Fourier transform for real, real-odd, real-even discrete time signals.

(b) Compare energy and power signal. Determine whether following signal is energy or power and find it's value. **07**
$x(t) = e^{-at}u(t)$

Q.2 **(a)** Find the Z- transform and ROC of the signal. **07**
$x(n) = 3[(2^n) - 4(3^2)]u(n)$

(b) Find if the following systems are linear, causal, stable, time-invariant and memory less. **07**
(i) $x_1(n) = \sum_{k=-\infty}^{\infty} x(k)$
(ii) $x_2 = x(n - n_o)$
(iii) $x_3 = x(n) + nx(n+1)$

OR

(b) Determine inverse Z transform of the following by partial fraction expansion. **07**

$$x(z) = \frac{z+2}{2z^2 - 7z + 2}$$

If R.O.C is (i) $|z| > 3$, (ii) $|z| < 3$, (iii) $\frac{1}{2} < |z| < 3$

Q.3 **(a)** (i) Define ROC of Z transform and explain unilateral and Bilateral Z transform. **07**
(ii)Define term linearity and time invariance as applied to any discrete time system.

(b) Find the impulse response for the system. **07**

$$y(n) - \frac{1}{12}y(n-1) - \frac{1}{12}y(n-2) = x(n)$$

OR

Q.3 **(a)** Find the convolution of the two signals. When ROC (i) $|a| < 1$ **07**
$n \geq 0$
$x(n) = u(n) and\ h(n) = a^n u(n)$

(b) Write difference between DFT and DTFT. State and prove Shifting, convolution and time reversal properties of DFT. **07**

Q.4 **(a)** Find the response of FIR filter with impulse response h(n) = {1,2,4} to the input sequence x(n) = {1,2} using circular convolution method. **07**

(b) Explain the minimum-phase and all-pass decomposition of a system. **07**

OR

Q.4 **(a)** Given $x(n) = 2^n$ and N= 8 find x(k) using DITFFT algorithm. **07**

(b) Find the no of complex multiplication and complex additions required in the direct computation of 1024 point DFT. How many complex multiplications and complex additions will be required using FFT algorithm? **07**

Q.5 **(a)** Develop a direct form I realization of the difference equation. **07**

$$y(n) = b_0x(n) + b_1x(n-1) + b_2x(n-2) + b_3x(n-3) - a_1y(n-1) + a_2y(n-2) + a_3y(n-3)$$

(b) Draw the block diagram of a digital signal processor with Harvard architecture and describe the important differences with Von-Neumann architecture. **07**

OR

Q.5 **(a)** The transfer function of analog filter is given below with Ts = 0.1 sec. Design the digital IIR filter using BLT. **07**

$$H(s) = \frac{3}{(s+2)(s+3)}$$

(b) Explain window function used in FIR filter design also explain difference between FIR and IIR filters in detail. **07**

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