

GUJARAT TECHNOLOGICAL UNIVERSITY**BE SEM-VIII Examination May 2012****Subject code: 182402****Subject Name: - Digital Signal Processing****Date: 12/05/2012****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instruction:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.
4. Notations/ symbols used have usual meanings.

Q.1 (a) For the system described by $y(t) = x(2t)$, determine whether the system is (i) Stable (ii) causal (iii) linear (iv) time – invariant and (v) memory less or not. **05**

(b) Differentiate: Energy and Power signal. **03**

(c) For **06**

$$x[n] = \begin{cases} 0 & \text{if } n < 2 \\ 2n - 4 & \text{if } 2 \leq n < 4 \\ 4 - n & \text{if } 4 \leq n \end{cases}$$

- (i) Sketch $x(n)$.
- (ii) Sketch $y_1(n) = x(n-1)$.
- (ii) Sketch $y_2(n) = 2x(n+1)$.

Q.2 (a) **07**

State the sampling theorem, given $x(t) \xleftrightarrow{fT} X(w)$. For the spectrum of the continuous-time signal, shown in Fig.1, consider the three cases $f_s = 2f_x$; $f_s > 2f_x$ and $f_s < 2f_x$; draw the spectra, indicating aliasing.

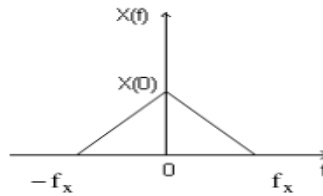


Fig.1

(b) Find and sketch the autocorrelation function $R_{xx}(\tau)$ for $x(t) = e^{-at} u(t)$, $a > 0$. **07**

OR

(b) Obtain $y(n) = h(n) * x(n)$ if $h(n) = \{1, 2, 1, -1\}$ and $x(n) = \{1, 2, 3, 1\}$. **07**

\uparrow
 $n = 0$

\uparrow
 $n = 0$

Q.3 (a) An LTI system has impulse response $h(n) = 5(-1/2)^n u(n)$. Determine Fourier Transform to find the output of this system when the input is $x(n) = (1/3)^n u(n)$. **07**

(b) State and prove properties of Fourier transform. **07**

OR

Q.3 (a) Consider the linear constant coefficient difference equation $y(n] - (3/4)y(n-1) + (1/8)y(n-2) = 2x(n-1)$. Determine $y(n)$ for $n \geq 0$ **07**

when $x(n) = \delta(n)$ and $y(n) = 0$ for $n < 0$. Plot resultant $y(n)$.

- (b) Determine Fourier transform of the causal sequence $x(n) = a^n u(n)$ for $|a| < 1$. Plot its both $x(n)$ and its magnitude response. **07**

- Q.4** (a) Obtain relation between z- transform and discrete Fourier transform. **07**

- (b) Determine the inverse z-transform of the function **07**

$$x(z) = \frac{z}{z - 0.5}, \quad |z| > 0.5$$

OR

- Q.4** (a) Obtain z- transform for **07**

(i) $x_1(n) = (1/2)^n u(n) + (2)^n u(n)$

(ii) $x_2(n) = -a^n u(-n - 1)$.

Plot pole –zero diagram and state ROC for both.

- (b) State and prove various properties of Z –transform. **07**

- Q.5** (a) Discuss the concept of zero input limit cycle oscillation. How this can be eliminated? **07**

- (b) Describe any one type of DSP architecture. **07**

OR

- Q.5** (a) For $H(z) = 2/(z+3)$, sketch Direct form - II and its transposed realization . **07**

- (b) What are the different formats of fixed point representation? Explain the fixed point representation of binary numbers. **07**
