(61-A)

No. of Printed Pages. 02

SARDAR PATEL UNIVERSITY

M.Sc. (Electronics and Communication) (SEM – I) Examination 2012

Day & Date: 5/12/2012, Wednesday

Time: 10:30 am To 1:30 pm

Course Code: PS01CELC03 **Course: Signals and Systems**

Note:

(a) *Figure to the right indicates maximum marks.*

(b) *All questions are compulsory.*

Total Marks: 70

Q-1 Multiple Choice Questions **(08)**

1 An analog electrocardiogram signal contains a frequency up to 100 Hz. What is the Nyquist rate for the signal?

(A) 50 Hz (B) 100 Hz (C) 200 Hz (D) 300 Hz

2 If the discrete time sampled signal is given by $x(n)=3\cos\left(\frac{\pi n}{2}\right)$ with Fs=300 Hz, what is the continuous time signal obtain using ideal interpolation?

(A) $x(t)=3\cos(300\pi)$ (B) $x(t)=3\cos(150\pi)$ (C) $x(t)=3\cos(75\pi)$ (D) $x(t)=3\cos(0.25\pi)$

3 Which of the following statement is true?

(i) A static system is memory less system

(ii) A dynamic system has a finite or infinite memory.

(A) (i) is true (B) (ii) is true (C) (i) and (ii) is both (D) Neither (i) Nor (ii)

4 If $x(n)=\left\{1,\underset{\uparrow}{1},1,1,\frac{1}{2},\frac{1}{2}\right\}$ then $x(4-n)=$ _____ .

(A) $\left\{\frac{1}{2},\frac{1}{2},1,1,1,1\right\}$ (B) $x(n)=\left\{1,1,1,1,\frac{1}{2},\frac{1}{2}\right\}$ (C) $x(n)=\left\{0,1,1,1,1,\frac{1}{2},\frac{1}{2}\right\}$ (D) $x(n)=\left\{0,\underset{\uparrow}{1},1,1,1,\frac{1}{2},\frac{1}{2}\right\}$

5 The z – transform of $a^n u(n)=$ _____.

(A) 1 (B) $\frac{1}{1-az^{-1}}$ (C) $\frac{z^{-1}}{1-az^{-1}}$ (D) $\frac{az^{-1}}{1-az^{-1}}$

6 The ROC of the Z transform of the discrete time sequence $x(n)=\left(\frac{1}{3}\right)^n u(n)-\left(\frac{1}{2}\right)^n u(-n-1)$ is

(A) $\frac{1}{3}<|z|<\frac{1}{2}$ (B) $|z|>\frac{1}{2}$ (C) $|z|<\frac{1}{3}$ (D) $2<|z|<3$

7 The average power of the discrete time periodic signal with period N is defined as

(A) $P_x=\frac{1}{N}\sum_{n=0}^{N-1}|x(n)|^2$ (B) $P_x=\sum_{n=0}^{N-1}|x(n)|^2$ (C) $P_x=\frac{1}{N}\sum_{n=0}^{N-1}|x(n)|$ (D) $P_x=\sum_{n=0}^{N-1}|x(n)|$

8 The N point DFT of $\delta(n)$ is

(A) 1 (B) $j2\pi kn/N$ (C) $-j2\pi kn/N$ (D) $e^{-j2\pi kn/N}$

Q-2 Answer the following Questions. (Any Seven) **(14)**

1. Write the properties of Continuous time sinusoidal signal and discrete time sinusoidal signal.
2. Explain symmetric and anti-symmetric signal with example.

P.T.O

3. A discrete time signal $x(n) = \{1, -1, \underset{\uparrow}{2}, 5, 1\}$ sketch the advanced sequence and delayed sequence by 2 samples.
4. Mention and draw the ROC of the all finite duration sequences.
5. Determine the z – transform and ROC of the signal $x(n) = [3(2)^n - 4(3)^n]\, u(n)$.
6. Give the Dirichlet conditions.
7. Write the synthesis and analysis equations for a continuous time periodic signal and a-periodic signal.
8. Determine all the values in the 4 – point twiddle factor matrix.
9. Explain the circular time shift and circular frequency shift properties of DFT.

Q-3 **(A)** What do you mean by Sampling? State the sampling theorem and discuss the sampling of an analog signal. **(06)**

(B) Determine whether the following signals are periodic or not ,if periodic then find their period **(06)**

(i) $x(n) = 2\cos\left(\frac{n\pi}{4}\right) - \sin\left(\frac{n\pi}{6}\right) + 3\cos\left(\frac{n\pi}{8} + \frac{\pi}{3}\right)$ (ii) $x(n) = \cos\left(\frac{32\pi n}{10}\right)$ (iii) $x(n) = \cos\left(\frac{n\pi}{6}\right) \cdot \cos\left(\frac{n\pi}{9}\right)$

OR

(B) Discuss in detail classification of discrete time systems with example of each. **(06)**

Q-4 **(A)** Determine the convolution sum of the following discrete time signals using graphical method and verify it by tabular method **(06)**

$x(n) = \{1, 2, \underset{\uparrow}{0}, 1, 2\}$ and $h(n) = \{\underset{\uparrow}{1}, -2, -3, 4\}$

(B) Determine the total response y(n) of the system described by following input output difference equations. $y(n) - 0.75y(n-1) + 0.125y(n-2) = x(n)$ *with* $x(n) = u(n)$ **(06)**

OR

(B) Using power series expansion method, determine inverse z-transform of **(06)**

$X(z) = \frac{1 + 2z^{-1}}{1 - 2z^{-1} + z^{-2}}$ If (a) x(n) is causal (b) x(n) is anti causal

Q-5 **(A)** Determine the z – transform and ROC of the following **(06)**

(i) $x(n) = a^n(\cos\omega_0 n)u(n)$ (ii) $x(n) = na^n u(n)$ (iii) $x(n) = (1+n)u(n)$

(B) Determine the inverse z transform using partial fraction expansion and find x(n) **(06)**

$X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$ if x(n) is causal and anti causal

OR

(B) Why we need the frequency analysis of discrete time signal? Obtain the discrete time Fourier series co-efficient Ck in terms of complex exponential. **(06)**

Q-6 **(A)** Define circular convolution and perform the circular convolution for the following two sequences $x_1(n) = \{\underset{\uparrow}{2}, 1, 2, 1\}$ and $x_2(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$ **(06)**

(B) What is Power Density Spectrum? Derive the power density spectrum for periodic discrete time signal. **(06)**

OR

(B) Compute the 4 point DFT of sequence $x(n) = \{\underset{\uparrow}{1}, 2, 3, 4\}$ using direct equation method and plot magnitude and phase spectrum of the DFT. **(06)**

— × —