



Name :

Roll No. :

Invigilator's Signature :

CS / B.TECH(EEE) / SEP.SUPPLE / SEM-7 / EEE-703 / 2012

2012

DIGITAL SIGNAL PROCESSING

Time Allotted : 3 Hours

Full Marks : 70

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

GROUP – A

(Multiple Choice Type Questions)

1. Choose the correct alternatives for any *ten* of the following :

10 × 1 = 10

i) Casual signals are

- a) right sided sequence
- b) left sight sequence
- c) both sided sequence
- d) none of these.

ii) If $x(n)$ upon z transform gives $X(z)$ then

- a) $x(-n) \leftrightarrow X(z)$
- b) $x(-n) \leftrightarrow z X(z)$
- c) $x(-n) \leftrightarrow X(z) / z$
- d) $x(-n) \leftrightarrow X(1/z)$.



- iii) Find the correct alternative :
- $x(t)^* \delta(t - t_0) = x(t - t_0)$
 - $x(t)^* \delta(t - t_0) = 1$
 - $X(t)^* \delta(t - t_0) = x(t_0)$
 - $X(t)^* \delta(t - t_0) = x(t)$.
- iv) The number of multiplications required to compute N-point DFT using radix-2 FFT is
- $N/2 \cdot \log_2 N$
 - $N/2 \cdot \log_2(N/2)$
 - $N \cdot \log_2 N$
 - $N \cdot \log_2(N/2)$.
- v) Fourier transform of $\cos n\omega_0$ is
- $\pi\delta(\omega + \omega_0) + \pi\delta(\omega - \omega_0)$
 - $\pi\delta(\omega + \omega_0) - \pi\delta(\omega - \omega_0)$
 - $\pi\delta(\omega + \omega_0) + 2\pi\delta(\omega - \omega_0)$
 - $2\pi\delta(\omega + \omega_0) + \pi\delta(\omega - \omega_0)$.
- vi) The convolution sum is
- $Y(n) = x(n)^* y(n)$
 - $Y(n) = \sum_{k=-\infty}^{\infty} x(k)\delta(n - k)$
 - $Y(n) = \sum_{k=-\infty}^{\infty} x(k)h(n - k)$
 - $Y(n) = \sum_{k=-\infty}^{\infty} x(k)h(k)$.
- vii) Direct form – I and direct form – II exists for
- FIR system only
 - IIR system only
 - Both (a) and (b)
 - Analog filter.
- viii) The z transform of delta function is
- 1
 - $1/(1-z)$
 - $1/(1 - z^{-1})$.



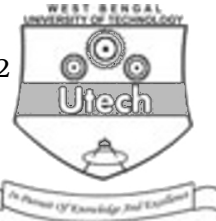
- ix) The z transform of unit step function is
- 1
 - $1/(1-z)$
 - $1/(1-z^{-1})$
- x) If $x(n) = \{ 1, 0, 0, 1 \}$, the DFT value $x(0)$ is
- 2
 - $1 + j$
 - 0
 - $1 - j$.
- xi) Which of the following is *not* a property of FIR filter ?
- Always stable
 - Physically realizable
 - Non-linear phase response
 - Linear phase response.

GROUP - B

(Short Answer Type Questions)

Answer any *three* of the following. $3 \times 5 = 15$

- Find the Z-transform and explain ROC of the following.
 - $X1[n] = \{ 2, 4, 5, 7, 0, 1 \}$
 - $X2[n] = \delta [n - k], k > 0$.
- Determine Z-transform of $x[n] = \left(\frac{1}{2}\right)^n u[n]$ and explain ROC.
- Find out convolution of two sequences $x1[n] = \{ 1, -2, 1 \}$ and $x2[n] = \{ 1, 1, 1, 1, 1 \}$
- Draw the phase and magnitude spectrum of the periodic sequence : $x[n] = \{ 1, 1, 0, 0 \}$.
- Explain the different types of filters in digital systems.
- Explain the different types of window in digital systems.



GROUP – C

(Long Answer Type Questions)

Answer any *three* of the following. $3 \times 15 = 45$

8. Determine the inverse Z-transform
 $X(z) = 1/(1 - 1 \cdot 5z^{-1} + 0 \cdot 5z^{-2})$
when ROC : $\text{mod}(z) > 1$
when ROC : $\text{mod}(z) < 0.5$.
9. a) Derive the expression for Discrete Fourier Series coefficient $[C_k]$ and for real signal.
b) Explain the properties of DFT.
10. Design low pass FIR filter for $N = 5$ and $\omega_c = 0 \cdot 5$ rad, using Hanning window.
11. Find $X(k)$ by using decimation in time FFT algorithm of the sequence : $x(n) = \{ 3, 1, 5, 4, 2, 1, 0, 1 \}$.
12. Write short notes on any *three* of the following : 3×5
- a) Properties of Z-transform
 - b) Odd and even signals
 - c) DFT and FFT
 - d) Butterworth or Chebyshev filter
 - e) Convolution.
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