

4.6.14

ELEC/IV/CBGS/SP

QP Code : NP-19788

(3 Hours)

[Total Marks : 80]

- N.B. :** (1) Question No. 1 is compulsory.
 (2) Answer any three question out of remaining five questions.
 (3) Assume suitable data wherever required.

1. Solve the following :—

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(a) Determine the periodicity of the following continuous time signal :

$$x(t) = 5 \cos 4\pi t + 3 \sin 8\pi t.$$

(b) Find the z-transform and ROC of the following infinite duration signal :

$$x(n) = a^n U(n) + b^n u(-n-1)$$

(c) Determine whether the following signal is energy or power signal or neither

$$x(n) = \left(\frac{1}{4}\right)^n u(n)$$

(d) State Sampling Theorem and explain how aliasing error occurs ?

2. (a) Classify the following system as linear, non-linear time-variant, time invariant, causal, non causal, static, dynamic. 10

$$y(n) = nx(n) \text{ and } y(n) = x(n^2)$$

(b) An LTI system is described by the equation : 10

$$y(n] = x(n) + 0.8 x(n-1) + 0.8 x(n-2) - 0.49 y(n-2)$$

Determine the transfer function of the system. sketch the poles and zeros on the z-plane.

3. (a) State and prove differentiation property of z-transform. 5

(b) Perform linear convolution using circular convolution. 5

$$x_1(n) = \{2, 1, 2, 1\}$$

$$x_2(n) = \{1, 2, 3, 4\}$$

(c) Obtain the magnitude and phase response of the following system by Analytical and Geometric Method. 10

$$h(n) = \{1, \frac{1}{2}\}$$

4. (a) Determine the inverse z-transform of the function :— 10

$$X(z) = \frac{1}{1 - 1.5z^{-1} + 0.5z^{-2}}$$

(i) ROC $|z| > 1$ (ii) ROC $|z| < 0.5$ (iii) ROC $0.5 < |z| < 1$

Sketch for all ROC.

(b) Using radix 2 DIT FFT algorithm compute 8-point DFT for the given : 10

$$x(n) = \{0, 1, 1, 1, 1, 1, 1, 1\}$$

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5. (a) Determine the response of LTI system governed by the difference equation : 10
$$y(n) - 0.5 y(n-1) = x(n]$$
for input $x(n) = 5^n u(n)$ and initial condition $y(-1) = 2$
- (b) Compute DFT of the 4 point sequence of the following :— 10
(i) $x(n) = \{ 0, 1, 2, 3 \}$
(ii) $x(n) = \{ 1, 2, 3, 1 \}$
6. Write short notes on the following :—
- (a) Power Spectral Density. 5
 - (b) Properties of DFT. 5
 - (c) System classification as Minimum phase, maximum phase and mixed phase. 5
 - (d) Filter classification based on passband. 5

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Con. 13026-14.