

[Time: 3 Hours]

[Marks:80]

Please check whether you have got the right question paper.

- N.B:
1. Question.No.1 is compulsory.
 2. Attempt any three from the remaining.
 3. Assume suitable data if required.

Q.1 a) Write properties of DFT. Explain any two in detail. (05)

b) Determine the periodicity of the following continuous time signal (05)

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

c) State sampling theorem and explain how aliasing error occurs. (05)

d) Find $x(n)$ considering all possible region of convergence. (05)

$$x(z) = \frac{10z}{(z-1)(z-2)}$$

Q.2 a) Design a linear phase FIR low pass filter a length seven with cut-off frequency 1rad/sec using rectangular window. (10)

b) Determine whether the system is static causal, time invariant, linear and stable (10)

i) $y(t) = x(t+1) + x(t^2)$

ii) $y(t) = x(t-5) - x(2-t)$

Q.3 a) The system transfer function of analog filter is given by (10)

$$H(S) = \frac{S+0.1}{(S+0.1)^2+16}$$

Obtain the system transfer function of digital filter using BLT which is

resonant at $Wr = \frac{\pi}{2}$.

b) Sketch the following signal:- (05)

$$x(t) = 2u(t) + tu(t) - (t-1)u(t-1) - 3u(t-2)$$

c) Separate out the even and odd component of:-

(05)

$$x(n) = \{1, 3, 2, 1, -2\}$$



Q.4 a) Obtain linear convolution using circular convolution for:-

(10)

$$x(n) = \{1, 3, 2, \} \text{ and } h(n) = \{1, 2\}$$



b) What is ROC? How stability can be obtained by ROC, explain with example.

(05)

c) Determine the inverse Z-transform y:-

$$X(Z) = \frac{Z^{-1}}{\left(1 - \frac{1}{2}Z^{-1}\right)\left(1 - \frac{1}{3}Z^{-1}\right)}$$

for the following condition:-

1. Causal

2. Anti-causal

3. Stable

Q.5 a) A LTI system is described by the difference equation:-

(10)

$$y(n] = x(n) + 2x(n-1) - 6y(n-1) - 8y(n-2)$$

Find Impulse response.

b) A 8 point sequence is given by

(10)

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

Compute radix x-2 DITFFT.

Q.6 Write short notes on any two.

(10)

1. properties of Z transform

(05)

2. advantages and disadvantages of FIR system

3. energy / power signal
