

[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
2. advantages and disadvantages of FIR system
3. energy / power signal

(05)
