[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)**

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

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

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

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)**

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

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

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

b) Sketch the following signal:- **(05)**
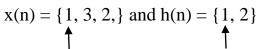
$x(t) = 2u(t) + tu(t) - (t-1) u(t-1) - 3u(t-2)$

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)**

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

b) What is ROC? How stability can be obtained by ROC, explain with **(05)**
example.

c) Determine the inverse Z-transform y:-

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

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

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