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9D

S.E Electrical IV CBGS

Signal Processing

2.6.15

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QP Code : 3495

[3 Hour] Total Marks: 80

NB 1) Q1 is compulsory.

2) Attempt any **three** questions from remaining questions

3) Assume suitable data wherever required.

Q1) a) Sketch the signal $x(t) = 2u(t) + tu(t) - (t-1)u(t-1) - 3u(t-2)$ [5*4]

b) State and prove Parseval's theorem for non-periodic signals.

c) Find the Z transform of the given function

$x(n) = (1/4)^n u(n) + (1/5)^n u(-n-1)$

d) Compute DFT of the given sequence $x(n) = \{0,1,2,3\}$

Q2) a) Determine the inverse Z-transform

$$H(Z) = \frac{(Z-1)(Z+2)}{(Z-\frac{1}{2})(Z-\frac{3}{4})} \quad \text{ROC: } |Z| > \frac{3}{4}$$ [05]

b) Find the initial value and final value of

$$X(Z) = \frac{Z}{4Z^2 - 5Z - 1} \quad \text{ROC: } |Z| > 1$$ [05]

c) An LTI system is described by $2y(n) + 3y(n-1) + y(n-2) = u(n) + u(n-1) - u(n-2)$. Find the response of the system when initial conditions are given $y(-1) = 2$, $y(-2) = -1$ and unit step is applied at the input. [10]

Q3) a) Show pole Zero diagram of the given transfer function

$h(n) = (0.5)^n \quad 0 \le n \le 7$ [10]

b) The difference equation of the system is given as $y(n) = 2x(n) + x(n-1)$. Find the magnitude and phase response. [10]

Q4) a) Classify the following systems as linear, non-linear, time-variant, time invariant, causal, non-causal, static, dynamic, stable and unstable. [10]

a) $y(n) = n\,x(n)$ b) $y(t) = x(t^2)$

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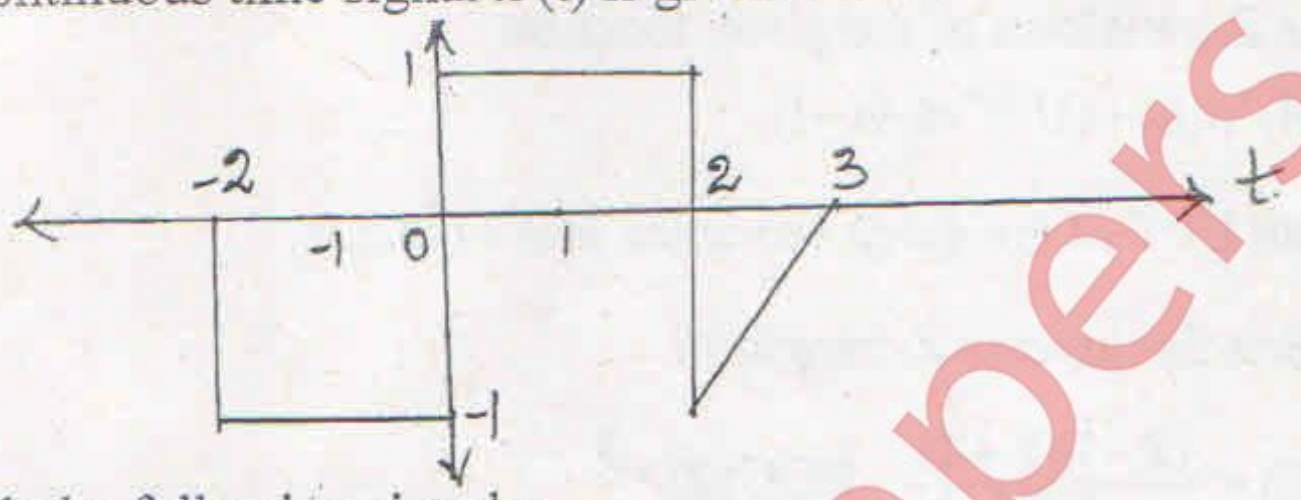
b) Find the inverse z-transform of the $X(z) = \frac{z}{3z^2 - 4z + 1}$ for the following ROC conditions: 1) $|z| > 1$ 2) $|z| < 1/3$ 3) $1/3 < |z| < 1$ [10]

Q5) Obtain the magnitude and phase response of the following system by Analytical and Geometric method:

$h(n) = \{1, 1/2\}$ [10]

b) A continuous time signal x (t) is given below: [10]



Sketch the following signals:

a) $x1(t) = x(-t)$ **b)** $x2(t) = -2x(t)$ **c)** $x3(t) = x(t-3) - 2x(t)$ **d)** $x4(t) = x(t/2)$

Q6) a) An 8 point sequence is given by $X(n) = \{2,2,2,2,1,1,1,1\}$. Compute 8 point DFT of x(n) by radix -2 DIT – FFT method. [10]

b) Prove any four DFT properties [10]