12/12/2024 ELECTRICAL SEM-VI C SCHEME SIGNALS AND SYSTEMS QP CODE: 10056445

Duration : (3 Hours) **Total Marks: 80**

N.B: (1) Question No. 1 is compulsory.(any four)
(2) Attempt any three from the remaining questions.
(3) Assume suitable data wherever required.

Q1. a) Find out even and odd part of signal x(t) = $x(t) = (4 + sint)^2$. **(20)**

b) Find the Z-transform of a signal given by $X(z) = \frac{1}{4}\frac{z^{-1}(1-z^{-4})}{(1-z^{-1})^2}$

c) Find the N-point DFT of the following sequence

$x = 5 + cos^2\left(\frac{2\Pi n}{N}\right)$ for n= 0,1.

d) Find the fundamental frequency in rad/s for a periodic signal

$v(t) = 15sin100t + 05cos300t + 03sin(500 + \frac{\Pi}{4})$

e) Find the causal signal with Z- transform $z^2(z-a)^2$

f) Consider a continuous -time system with *i/p x(t)* and *o/p y(t)* given by *y(t) =x(t)cos(t)* and explain in brief the given system is linear and time variant.

Q2.a) Consider an LTI system with difference equation, **(10)**

y(n)- 3/4 y(n-1)+1/8 y(n-2) = 2x(n). Find *H(z)*.

b) Explain the disadvantages of direct computation of DFT and advantage of FFT. **(10)**

Find the 8-point DFT of the sequence x(n) = {1, 2, 3, 4, 4, 3, 2, 1} using DIT-FFT radix-2 algo-
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Q3 a) Find the 8-point DFT of the sequence x(n) = {1,2,3,4,4,3,2,1} using DIT-FFT radix-2 algorithm. **(10)**
rithm.

b) List the properties of region of convergence for the z-transform. **(10)**

Q4) . a) Explain any five properties of Z-transform. **(10)**

b. Using Bilinear transformation, obtain Butterworth filter design which satisfies the following conditions

$0.8 \leq |H(e^{jw})| \leq 1$ $\quad 0 \leq w \leq 0.2\pi$ **(10)**

$|H(e^{jw})| \leq 0.2$ $\quad 0.6\pi \leq w \leq \pi$

Q5) a) Define LTI system. Check the causality, time invariance and linearity of the system y(n)= $x(n^2)$. **(10)**

b) State and prove the linearity and time reversal properties of Z- transform **(10)**

Q6) (A) 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 poles and zeroes on the z-plane.

(B) Find y(n) by using convolution if x(n) = [1,3,5,3] and h(n) = [2,3,1,1]. **(10)**
