Exam. Code: 0937
Sub. Code: 6993

1079

B. Engg. (Electrical & Electronics Engg.)

7th Semester

EE-708: Digital Signal Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt **five** questions in all, including Q. No. 1 which is compulsory and selecting atleast two questions from each Part-A & B.*

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Q1a) Find the energy spectral density for the following signal

$x(t) = e^{-2t}\, u(t)$?

(2 Marks)

b) Determine the frequency response of FIR filter defined by $y(n)=0.25\, x(n)+x(n-1)+0.25x(n-2)$. Calculate the phase delay and group delay?

(2 Marks)

c) An analog signal $x(t) = 3\cos(50\pi t) + 2\sin(300\pi t) - 4\cos(100\pi t)$ is sampled with sampling frequency of 200 Hz. What are the frequencies in recovered signal?

(2 Marks)

d) Compute the computation efficency of 1024 point radix 2 FFT over 1024 point DFT?

(2 Marks)

e) Determine the output of the recursive system described by the following difference equation

$y(n+2)+3y(n+1)+2y(n)=u(n)$ where $y(0)=0, y(1)=1$ and $u(n)$ is unit step response?

(2Marks)

Part-A

Q2a) Find x(n) of

$X(z) = \frac{z(z^2+z-30)}{(z-2)(z-4)^3}$ for ROC $|z|> 4$ using partial fraction method?

(5Marks)

b) Check for following systems are linear, causal, time invariant and stable

i) $y(n) = x(-n)$

ii) $y(n) = x(n^2)$

iii) $y(n) = x(n)x(n-1)$

iv) $y(n) = nx(n)$

v) $y(n) = \text{sgn}|x(n)|$

(5 Marks)

P.T.O.

Q 3a) The impulse response h(n) of a certain LTI system is given by $h(n)=a^n u(n)$ where $0<a<1$. The system is excited by $x(n)=u(n)$, a step sequence.Find y(n) using convolution sum? (5Marks)

b) Determine the output response y(n) if $h(n)=\{1,1,1\}$ and $x(n)=\{1,2,3,1\}$ by using i) linear convolution and ii) circular convolution ? (5 Marks)

Q 4 a) Explain the difference between DFT and DTFT? Also explain Parseval's theorem of DFT? (5 Marks)

b) Find the IDFT of sequence X (k) = (10, -2+j2, -2, -2-j2) using radix 2 DIT FFT algorithm? (5 Marks)

Part-B

Q5a) For the analog transfer function $H(s) = \frac{s+0.3}{(s+0.3)^2+16}$

Determine H (z) using bilinear transformation. With T=1 sec ? (5 Marks)

b) Obtain the cascade realizations of linear phase FIR filter for the following systems

$H(z) = (1 + 0.5z^{-1} + z^{-2})\,(2 + 0.25z^{-1} + 2z^{-2})$ (5 Marks)

Q6 a) What is Gibb's Phenomena? How it is eliminated using different kind of window functions? (5 Marks)

b) The desired response of a LPF is

$$H_d(w) = e^{-j3w} \qquad 0 \le w \le \frac{\pi}{2}$$

$$= 0 \qquad \frac{\pi}{2} \le w \le \pi$$

Determine filter coefficents h(n) for N=7 using type 1 frequency sampling method (5 Marks)

Q7a). Explain how Harvard architecture as used by the TMS320 family differs from the strict Harvard architecture? Compare this architecture with the architecture of Von-Neumann processor (5 Marks)

b) With a suitable diagram describe the functions of multiplier/adder unit of TMS320C5X DSP processor (5 Ma

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