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Exam. Code: 0936
Sub. Code: 6952

1079

B. Engg. (Electrical & Electonics Engg.)

6th Semester

EE-603: Digital Signal Processing

Time allowed: 3 Hours

Max. Marks: 50

NOTE: *Attempt* ***five*** *questions in all, selecting atleast* *two* *questions from each Part-A & B.*

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Part-A

1. Find whether the following systems are Memoryless, Time- Invariant, Linear, Causal, and Stable. Justify your answer. (10)
   a) $y(t) = x(t-2) + x(2-t)$
   b) $y(t) = \frac{d}{dt}x(t-1)$
   c) $y[n] = \log_{10}(|x[n]|)$
   d) $y[n] = \sum_{k=-\infty}^{n} x[k+2]$

2. (a) Determine the response y(n) of the system (5)

$$y[n] - 4y[n-1] + 4y[n-2] = x[n] - x[n-1]$$

When the input is $x[n] = (-1)^n u[n]$ and the initial conditions are y(-1) = y(-2) = 0

(b) Find the Z-transform of the sequence: (5)

$$x(n) = \left(\frac{1}{4}\right)^n u(3-n)$$

3. (a) Determine the response of the system with impulse response $h(n) = (a)^n u(n)$ to the input signal $x(n) = u(n) - u(n-10)$. (5)

(b) Describe the Divide and Conquer approach for calculation of DFT. Discuss radix-2 DIT FFT algorithm with the help of butterfly diagram. (5)

4. (a) Describe the expression for Interpolation function. Discuss practical sampling and various considerations. (5)

(b) Find the inverse Z-transform of a stable system (5)

$$H(z) = \frac{z^{-1}}{\left(z - \frac{1}{2}\right)\left(1 + \frac{1}{2}z^{-1}\right)}$$

P.T.O.

Part-B

5. (a) A LPF is to be designed with the following desired response (5)

$$H_d(\omega) = \begin{cases} e^{-j3\omega} & 0 \le \omega \le \frac{\pi}{2} \\ 0 & \frac{\pi}{2} \le \omega \le \pi \end{cases}$$

Determine the filter coefficients h(n) for M=7 using bartlett window.

(b) Describe finite word length effects in digital filters. How can they be minimized? (5)

6. Design a digital Chebyshev filter to satisfy the criterion

$$0.86 \le H(\omega) \le 1, \qquad 0 \le \omega \le 0.25\pi$$
$$H(\omega) \le 0.21, \qquad 0.48\pi \le \omega \le \pi$$

Using impulse invariant transformation. (10)

7. (a) Obtain the cascade and parallel form structure of system (5)

$$H(z) = \left(\frac{1 + 2z^{-1}}{1 - 0.6z^{-1}}\right)\left(\frac{1 + z^{-1} + 2z^{-2}}{1 - 1.2z^{-1} + 0.6z^{-2}}\right)$$

(b) Describe the architecture of TMS320C5X processor and discuss memory management. (5)

8. Describe the following:
   a. Digital frequency transformation
   b. Addressing modes of TMS320C series
   c. Digital filter design steps (4, 3, 3)

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