ELE303 / PSELT303.1 / PSELT303-DSE-1 - Digital Signal Processing Paper-III

P. Pages : 2   **GUG/W/18/11255**

Time : Three Hours |||||||||| *3558*   Max. Marks : 80

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Notes : 1. All questions are compulsory and carry equal marks.
2. Draw neat and labelled diagrams wherever necessary.
3. Use of log table/calculator is allowed.

1.   Either

a) What are different types of operations performed on signals. Explain with suitable examples.   **8**

b) Define: **8**

    i) Static / dynamic system

    ii) Time variant / time invariant

    iii) Casual / Non-casual system

    iv) Stable / Unstable system

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OR

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c) Perform the convolution sum using mathematical equation of convolution.   **8**
$$h(n) = \{1, \overset{\uparrow}{2}, 1, -1\} \quad x(n) = \{\overset{\uparrow}{1}, 2, 3, 1\}$$

    Also sketch the resultant signal.

d) Discuss the basic sequences and sequence operation in discrete time signals.   **8**

2.   Either

a) Find the Z-transform of second order recursive filter whose impulse response is: **8**
$$h(n) = \begin{cases} r^n \sin[\omega_0 n] & n \geq 0 \\ 0 & \text{elsewhere} \end{cases}$$

b) Find the Z-transform and RoC of the sequence $x[n] = r_1^n u[n] + r_2^n u[-n-1]$.   **8**

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OR

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c) Discuss the properties of region of convergence RoC.   **8**

d) Plot Pole/zero pattern of the following Z-transform equation   **8**
$$X[z] = \frac{z}{3} + \frac{1}{3} + \frac{z^{-1}}{3}.$$

3.   Either

a)   Design low pass filter of length $M = 61$ with pass band edge frequency $f_p = 0.1$ and   **8**
stopband edge frequency $f_s = 0.15$.

b)   Design bandpass filter of length $M = 32$ with passband edge frequencies   **8**
$f_{p1} = 0.2$ and $f_{p2} = 0.35$ and stopband edge frequencies $f_{s1} = 0.1$ and $f_{s2} = 0.425$.

<div align="center">**OR**</div>

c)   Discuss the process of design of IIR filters from analog filters.   **8**

d)   Convert the analog bandpass filter with system function $H_a(s) = \dfrac{1}{(s+0.1)^2 + 9}$ into a   **8**
digital IIR filter by use of backward difference for the derivative.

4.   Either

a)   Explain CPU, ALU and Accumulator of TMS320C54X family.   **8**

b)   Explain the echo-effect introduced in music.   **8**

<div align="center">**OR**</div>

c)   Draw the architectural block diagram of Motorola DSP 56000 family. Explain ALU and   **8**
memory.

d)   Explain various types of DSP processors with examples.   **8**

5.   a)   What are different test signals. Explain with suitable diagrams.   **4**

b)   Determine the casual signal x(n) having the z-transform   **4**

$$X(z) = \frac{1}{(1 + z^{-1})\,(1 - z^{-1})^2}$$

c)   Compare the digital FIR and IIR filters.   **4**

d)   Give the difference between DSP processors and general purpose processor.   **4**

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