Model Question Paper **BVL502**

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Fifth Semester B.E. Degree Examination

Digital Signal Processing

TIME: 03 Hours Max. Marks: 100

Note: 01. Answer any FIVE full questions, choosing at least ONE question from each MODULE

Module – 1

1 a. Define signals.Explain the classification of signals in detail. (6 Marks)
b. Sketch the even and odd component of the discrete time signal given
x(n)={1,2,2,3,4} (8 Marks)
c .Develop an expression for the convolution sum . (6 Marks)

OR

2 a. Define the following elementary signals
i) Unit sample signal ii) Unit step signal
ii)exponential signal iv) Ramp signal. (8 Marks)
b.Determine the given signal $x(n) = sin\frac{\pi}{2}n\ cos\frac{\pi}{3}n$ is periodic or not. If periodic find the fundamental period. (6 Marks)
c.Draw the block diagram representation of the given discrete time signal
$x(n) = 0.75y(n-2) + 0.25y(n-1) + 0.5x(n) + 0.25x(n-1)$ (6 Marks)

Module – 2

3 a. Find the Z-transform of the signal $x(n) = -a^n u(-n-1)$.Plot ROC (6 Marks)
b. Describe the process of frequency domain sampling and reconstruction (8 Marks)
c. Find the 5-pt DFT of the sequence $x(n) = \{1,2,3,4,5\}$. (6 Marks)

OR

4 a. Discuss briefly the properties of ROC (4 Marks)
b. Show that multiplication of the DFTs of two sequences is equivalent to the circular convolution of the two sequences in the time – domain. (6 Marks)
c. Compute the circular convolution using DFT and IDFT for the following sequence of $x_1(n)$={1,2,3,1} and $x_2(n)$={4,3,1,2 } (10 Marks)

Module – 3

5 a. Using overlap save method, compute the output of an FIR filter with impulse response $h(n) = \{1, 2, 3\}$ and input $x(n) = \{2, -2, 8, -2, -2, -3, -2, 1, -1, 9, 1, 3\}$ use only 6 – point circular convolution in your approach. (10 Marks)

b. Derive the DIT-FFT algorithm with necessary equation and also draw the signal flow graph for N=8. (10 Marks)

OR

6 a. State and prove the following properties of DFT .

i) Circular frequency shift ii)Parseval's Theorem (10 Marks)

b. Given x(n)={1,0,1,0,1,0,1,0} Find X(K) using DIT-FFT algorithm (10 Marks)

Module – 4

7 a. Illustrates the following with magnitude frequency response and side lobe attenuation

i)Rectangular window ii) Hamming window

iii) Hanning window iv) Bartlett windows (12 Marks)

b. Realize the system function given by $H(z) = 1 - 2z^{-1} + \frac{1}{2}z^{-2} + \frac{1}{2}z^{-3} + \frac{1}{2}z^{-4}$

i)Direct form ii) Cascade form. (8 Marks)

OR

8 a. Design a LPF using rectangular window given that cutoff frequency w_c=1 rad/sec

and take M=7. Also Find the magnitude response

$$H_d(e^{jw}) = e^{jw\tau} \qquad -wc \leq w \leq wc$$

0 Otherwise (12 Marks)

b. Explain Gibb's phenomenon. (4 Marks)

c. Discuss the difference between FIR and IIR Filters (4 Marks)

Module – 5

8 a. Define the first order analog low pass filter prototype. How this prototype is transformed into a different filter types? (10 Marks)

b. Assuming that $T = 2\ sec$ in BLT, and given the following points:

(i) $s = -1 + j$, on the left half of the s – plane.
(ii) $s = 1 - j$, on the right half of the s – plane.
(iii) $s = j$, on the positive $j\omega$ on the s – plane.
(iv) $s = -j$, on the negative $j\omega$ on the s – plane.

Convert each of these points in the s – plane to the z – plane, and verify the mapping properties . (6 Marks)

c. With a flow graph explain bilinear transformation design procedure (4 Marks)

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OR

10. a. Discuss the general mapping properties of Bilinear Transformation and show the mapping between s-plane and z-plane. (4 Marks)

b. Realize the system function given by $H(z) = \frac{1+z^{-1}-3z^{-2}+2z^{-3}}{(10-z^{-1})(1+0.5z^{-1}+0.5z^{-2})}$

i) Direct form I   ii) Direct form II (8 Marks)

c. An analog filter is given by $H(s) = \frac{3}{(S+3)(S+1)}$ with T=1sec. Find $H(z)$ using Bilinear transformation. (8 Marks)

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