Register No.: ..... Name: .....

SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTER B.TECH DEGREE EXAMINATION (S), FEBRUARY 2023
ELECTRONICS AND COMMUNICATION ENGINEERING
(2020 SCHEME)

Course Code : 20ECT303

Course Name: Digital Signal Processing

Max. Marks : 100 **Duration: 3 Hours**

PART A

(Answer all questions. Each question carries 3 marks)

1. Derive the relationship between DFT and Z Transform.
2. Find the 4 point DFT of sequence x(n)={1,1,0,0}.
3. Draw the 4 point radix 2 DIF FFT butterfly structure for DFT.
4. Bring out the computational advantage of performing an N-point DFT using radix-2 FFT algorithm.
5. What is Gibb's phenomenon?
6. Give the equation for the order N and cut off frequency of Butterworth filter.
7. Determine the direct form realization of FIR system function $H(z)=1+2z^{-1}-3z^{-2}-4z^{-3}+5z^{-4}$.
8. Obtain the direct form-I realization for the IIR system described by difference equation y(n)=0.5y(n-1)-0.25y(n-2)+x(n)+0.4x(n-1).
9. Compare the fixed point and floating point arithmetic.
10. Compare Von Neumann and Harvard architecture.

PART B

(Answer one full question from each module, each question carries 14 marks)

MODULE I

11. a) Perform the circular convolution using concentric circle method of the following sequences x(n)={1,1,2,1}; h(n)={1,2,3,4}. (9)
    b) Find the IDFT of Y(K)={1,0,1,0}. (5)

OR

12. a) Find the linear convolution of the sequences x[n]={2,1,0,1,3,2,0,1,2,2} and h[n] ={1,1,1} using overlap save method. (8)
    b) Explain the following properties of DFT a) Linearity b) Complex conjugate c) Circular convolution. (6)

MODULE II

13. Using DIF FFT algorithm compute the 8 point DFT of the sequence
$x(n)= 1;\ 0 \le n \le 7$
$0;$ otherwise. (14)

OR

14. Find the DFT of a sequence x(n)={1,2,3,4,4,3,2,1} using DIT FFT algorithm. (14)

MODULE III

15. Design a band pass filter using frequency sampling method with the following specifications.
Sampling frequency F=8000Hz, Cut off frequencies fc_1=1000Hz, fc_2=3000Hz. Determine the filter coefficients for N=7. (14)

OR

16. Design a Butterworth filter using the bilinear transformation for the following specifications
$0.8 \le |H(e^{jw})| \le 1;\ 0 \le w \le 0.2\pi$
$|H(e^{jw})| \le 0.2;\ 0.6\pi \le w \le \pi.$
Assume T=1 sec. (14)

MODULE IV

17. a) Obtain the cascade realization of FIR filter system function $H(z)=1+\frac{5}{2}z^{-1}+2z^{-2}+2z^{-3}$. (7)

b) Realize the IIR filter system with difference equation, $y(n)=-0.1y(n-1)+0.72y(n-2)+0.7x(n)-0.252x(n-2)$ in parallel form. (7)

OR

18. Obtain the direct form I, direct form II, cascade form and parallel form realization for the following IIR filter system, (14)
$y(n)= -0.1y(n-1)+0.2y(n-2)+3x(n)+3.6x(n-1)+0.6x(n-2).$

MODULE V

19. a) Explain the effect of coefficient quantization in IIR filter structures. (7)

b) With an example illustrate the error introduced by truncation and rounding in fixed point representation of numbers. (7)

OR

20. Explain the architecture of TMS320C67xx DSP with block diagram. (14)

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