B **810A4** Total Pages: **2**

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SAINTGITS COLLEGE OF ENGINEERING (AUTONOMOUS)

(AFFILIATED TO APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY, THIRUVANANTHAPURAM)

FIFTH SEMESTERB.TECH DEGREE EXAMINATION (Regular), DECEMBER 2022
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. Obtain the circular convolution of the following sequences x(n)={0,1,0,1} and y(n) ={1,2,1,2} .
3. Calculate the number of additions and multiplications in finding out the 16 point DFT of a sequence x(n) using direct DFT method and FFT algorithm.
4. Explain the symmetry and periodicity property of twiddle factor with example.
5. Explain Gibbs phenomenon. How it can be reduced.
6. Explain the significance of linear phase FIR filter.
7. Obtain the realization of the transfer function of the given FIR system with minimum number of multipliers.
$$H(z)=\frac{1}{4}+\frac{1}{2}z^{-1}+\frac{3}{4}z^{-2}+\frac{1}{5}z^{-3}+\frac{3}{4}z^{-4}+\frac{1}{2}z^{-5}+\frac{1}{4}z^{-6}$$
8. Explain decimation and interpolation.
9. Compare fixed point arithmetic and floating point arithmetic.
10. In what way a DSP processor differs from a general purpose microprocessor.

PART B

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

MODULE I

11. a) Determine the 8 point DFT of the sequence x(n)={1,1,1,0}. Also plot the magnitude and phase spectrum. (12)
    b) State any two properties of DFT. (2)

OR

12. Determine the linear convolution of the sequences x(n) = { 2,1,0,1,2,3,0,1,2,2 } and h(n) ={ 1,2,1 } using (14)
    i) Overlap save method
    ii) Overlap add method

MODULE II

13. a) Determine the DFT of the sequence x(n) ={1,1,1,1,0,1,1,1} using DIT algorithm. (10)

b) Draw the basic flow graph of radix 2 DIF FFT and DIT FFT. Compare DIT FFT and DIF FFT. (4)

OR

14. a) Compute the 4 point DFT of the sequences u(n)={1,2,0,1} and v(n)={2,2,1,1} using a single 4 point DFT. (9)

b) Compute the Inverse DFT of X(k) ={6,-2+2j,-2,-2-2j} using DIT algorithm. (5)

MODULE III

15. a) Design a linear phase FIR low pass filter using rectangular window for a cut off frequency ω_c=0.2π radians/sample. Assume the value of N as 7. (10)

b) Compare FIR and IIR filters. (4)

OR

16. a) Design an analog Butterworth filter for the given specifications (8)

$$0.9 \le |H(j\Omega)| \le 1 \quad \text{for } 0 \le \Omega \le 0.2\pi$$

$$|H(j\Omega)| \le 0.2 \quad \text{for } 0.4\pi \le \Omega \le \pi$$

b) Explain the steps to design digital filter using bilinear transformation. Apply bilinear transformation to obtain H(z) from H(s), when T=1 second. (6)

$$H(s)=\frac{2s}{s^2+0.2s+1}$$

MODULE IV

17. a) Obtain the direct form 1, direct form 2, cascade and parallel form realization of the IIR system (14)

y(n) = -0.1y(n-1) +0.2y(n-2) + 3x(n) +3.6 x(n-1) + 0.6 x(n-2)

OR

18. a) Explain the effect of up sampling and down sampling by a factor of 3 on a signal x(n). Also draw the frequency spectrum. (8)

b) What is aliasing? Explain the significance of anti aliasing filter and anti imaging filter in multirate signal processing. (6)

MODULE V

19. a) Draw and explain the internal architecture of TMS320C67XX digital signal processor. (10)

b) Explain the effects of quantization of filter coefficients. (4)

OR

20. a) With an example explain the errors introduced by truncation and rounding. (8)

b) Explain the quantization errors in FFT algorithm. (6)

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