ENTRI

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

Fifth Semester B.Tech Degree Examination December 2021 (2019 Scheme)

Course Code: ECT303

Course Name: DIGITAL SIGNAL PROCESSING

Max. Marks: 100 | Duration: 3 Hours (p. 1)

PART A

(Answer all questions; each question carries 3 marks)

1. **What are the methods of filtering long sequence? Explain. (p. 1)**
2. **Give any three properties of DFT. (p. 1)**
3. **Calculate the 4-point DFT of $\cos(\pi n)$. (p. 1)**
4. **Find Circular time reversal of [8, 5, 3, 1]. (p. 1)**
5. **Explain the design steps of IIR filter using Butterworth Approximation. (p. 1)**
6. **What are the advantages of frequency sampling technique in FIR filter design? (p. 1)**
7. **What is Cascade implementation of IIR filter? (p. 1)**
8. **What is a linear phase filter? What conditions are to be satisfied by an FIR filter in order to have linear phase? (p. 1)**
9. **Give any three differences between DSP processor and general purpose microprocessors. (p. 1)**
10. **Write down any three applications of DSP Processor. (p. 1)**

PART B

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

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Module - 1

11. a) Using an example elaborate the working of Overlap Save method while filtering a long sequence with small sequence. (7 marks) (p. 1)

b) Differentiate between Overlap methods and normal filtering. (7 marks) (p. 1)

OR

12. a) Explain how DFT can be used as a linear Transformation. (7 marks) (p. 1)

b) Calculate the DFT of [3, 19, 6, 15]. Also plot the magnitude and phase response. (7 marks) (p. 1)

Module - 2

13. a) Derive the Decimation in Time algorithm for Fast Fourier transform. (7 marks) (p. 1)

b) Find the DFT of [3, 4, 8, 1] using the above method. (7 marks) (p. 2)

OR

14. a) Illustrate the procedure for finding IDFT using radix-2 FFT algorithm. (5 marks) (p. 2)

b) Find the IDFT of [15, 21, 2, 13] using the above method. (9 marks) (p. 2)

Module - 3

15. a) Design a digital Butterworth lowpass filter satisfying the constraints: (p. 2)

$$0.707 \leq |H(e^{j\omega})| \leq 1 \text{ for } 0 \leq \omega \leq \frac{\pi}{2}$$

$$|H(e^{j\omega})| \leq 0.2 \text{ for } \frac{3\pi}{4} \leq \omega \leq \pi$$

Using bilinear Transformation, T = 1 Sec. (10 marks) (p. 2)

b) What is Gibb's phenomenon? (4 marks) (p. 2)

OR

16. a) Design a maximally flat analog filter of order 2 with cut-off frequency 0.6 rad/sec. (4 marks) (p. 2)

b) Design a digital lowpass filter and implement the above question using Impulse Invariance method. (10 marks) (p. 2)

Module - 4

17. a) Obtain the Direct form-I, Direct form-II, cascade and parallel form realization of y[n] =

$$= -0.1y[n-1] + 0.2y[n-2] + 3x[n] + 3.6x[n-1] + 0.6x[n-2].$$

(10 marks) (p. 2)

b) Find the impulse response of a filter given by

$$H(Z) = 1 - Z^{-1} + 2Z^{-1} + 3Z^{-1} + 5Z^{-1}.$$

Does this represent a linear phase realization? Comment. (4 marks) (p. 2)

OR

18. a) Represent the output of a signal being upsampled by a factor of 3, then down sampled by a factor of 12 followed by upsampled by a factor of 4. (7 marks) (p. 2)

b) Explain what is aliasing in Multi-rate signal processing. What is the use of Anti-aliasing filter? Explain. (7 marks) (p. 2)

Module - 5

19. a) In detail, explain the architecture of DSP Processor TMS 320C6713. (7 marks) (p. 2)

b) Illustrate the quantisation noise in ADC. (7 marks) (p. 2)

OR

20. a) List out the advantages and disadvantages of floating point DSP Processors. (7 marks) (p. 2)

b) Explain the usage of a DSP Processor for any two day to day applications. (7 marks) (p. 2)