

Reg No.: \_\_\_\_\_

Name: \_\_\_\_\_

**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

**PART A***(Answer all questions; each question carries 3 marks)*

Marks

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

**PART B***(Answer one full question from each module, each question carries 14 marks)***Module -1**

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|----|--|---|
| 11 | a) Using an example elaborate the working of Overlap Save method while filtering a long sequence with small sequence | 7 |
|    | b) Differentiate between Overlap methods and normal filtering  | 7 |
| 12 | a) Explain how DFT can be used as a linear Transformation  | 7 |
|    | b) Calculate the DFT of [3, 19, 6, 15]. Also plot the magnitude and phase response                                   | 7 |

**Module -2**

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|----|--|---|
| 13 | a) Derive the Decimation in Time algorithm for Fast Fourier transform. | 7 |
|----|--|---|

- b) Find the DFT of [3,4,8,1] using the above method 7
- 14 a) Illustrate the procedure for finding IDFT using radix-2 FFT algorithm 5
- b) Find the IDFT of [15,21,2,13] using the above method 9

**Module -3**

- 15 a) Design a digital Butter worth lowpass filter satisfying the constraints 10
- $$0.707 \leq |H(e^{jw})| \leq 1 \quad \text{for } 0 \leq w \leq \frac{\pi}{2}$$
$$|H(e^{jw})| \leq 0.2 \quad \text{for } \frac{3\pi}{4} \leq w \leq \pi$$

Using bilinear Transformation, T=1 Sec
- b) What is Gibb's phenomenon? 4
- 16 a) Design a maximally flat analog filter of order 2 with cut-off frequency 0.6 rad/sec 4
- b) Design a digital lowpass filter and implement the above question using Impulse Invariance method. 10

**Module -4**

- 17 a) Obtain the Direct form-I ,Direct form-II cascade and parallel form realization of  $y[n] = -0.1 y[n-1] + 0.2 y[n-2] + 3 x[n] + 3.6 x[n-1] + 0.6x[n-2]$  10
- 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
- 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
- b) Explain what is aliasing in Multi-rate signal processing. What is the use of Anti-aliasing filter? Explain. 7

**Module -5**

- 19 a) In detail, explain the architecture of DSP Processor TMS 320C6713 7
- b) Illustrate the quantisation noise in ADC. 7
- 20 a) List out the advantages and disadvantages of floating point DSP Processors. 7
- b) Explain the usage of a DSP Processor for any two day to day applications. 7

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