

Code No: R15A0415**MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY****(Autonomous Institution – UGC, Govt. of India)****III B.Tech II Semester Supplementary Examinations, April 2023****Digital Signal Processing****(ECE)**

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Time: 3 hours**Max. Marks: 75****Note:** This question paper contains two parts A and B

Part A is compulsory which carries 25 marks and Answer all questions.

Part B Consists of 5 SECTIONS (One SECTION for each UNIT). Answer FIVE Questions, Choosing ONE Question from each SECTION and each Question carries 10 marks.

PART-A (25 Marks)

- 1). a Test the given systems $y(n)=nx^2(n)$ and $y(n)=x(n)+x(n-1)$ are Shift Invariant or not? [2M]
- b Difference between Energy and Power of discrete time signals. [3M]
- c Draw the Butterfly diagram for 4 point DIT FFT. [2M]
- d Compare the computational complexity of FFT and DFT. [3M]
- e In what way Chebyshev filter is different from butterworth filter. [2M]
- f Write the difference between FIR and IIR [3M]
- g List out the types of structures used to realize FIR systems [2M]
- h Distinguish analog and digital filters. [3M]
- i Define interpolation and write the input output relationship for an interpolator [2M]
- j What is meant by multistage approach to sample rate conversion? [3M]

PART-B (50 MARKS)**SECTION-I**

- 2 For the given systems $y[n] = x[-n]$, $y[n] = x[-n+2]$, $y(n)=\cos[x(n)]$ verify the concepts of static or dynamic, linear or non-linear, and causal or non-causal. [10M]
- 3 a. Find the impulse response of the system $y(n) - y(n-1) = x(n) + x(n-1)$. [10M]
- b. Find Z – Transform of $x(n) = -a^n u(-n-1)$ and sketch its ROC in Z plane?

SECTION-II

- 4 State and prove any three properties of DFT. [10M]
- OR
- 5 Determine DFT of a given sequence $x(n)=\{1,1,0,0\}$ and find the IDFT for $Y(K)=\{1,0,1,0\}$. [10M]

SECTION-III

- 6 List out the steps involved and convert the analog filter with system function $H(s) = \frac{2s}{s^2 + 3s + 4}$ into a digital filter using Bilinear transformation. Take $T=1s$ [10M]
- OR
- 7 Design a digital butterworth filter to meet the following specifications: [10M]

Attenuation is 3db(max) upto 0.2π and Attenuation is 10db min above 0.35π . Use Bilinear transformation.

SECTION-IV

- 8 Design a FIR symmetric 7 tap filter to have a cutoff frequency $f_c=0.2\pi$ rad/sec. [10M]
Use Hamming window.

OR

- 9 Compare the various window functions and Obtain FIR linear-phase, direct form [10M]
realization of the system function $H(z)=1+2z^{-1}+3z^{-2}+4z^{-3}+3z^{-4}+2z^{-5}+z^{-6}$

SECTION-V

- 10 Discuss the process of Interpolation by a factor I with examples and also give the [10M]
applications of MultiMate signal processing.

OR

- 11 Describe the Decimation process and determine $Y(2n)$ for the discrete sequence [10M]
 $Y(n)=\{1,2,3,4,5,6,7,8,9\}$. Derive the spectrum of a down sampled signal.
