No. of Printed Pages : 03 **Roll No. .....**

18AA1151

M. Tech. EXAMINATION, 2020

(First Semester)

(C Scheme)

(Re-appear Only)

ECE

MTEC501C

Digital Signal and Image Processing

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all. Q. No. **9** is compulsory and contains *five* subparts each of 2 marks. Attempt any other *four* questions slecting at least *one* question frome each of four Units.

Unit I

1. (a) Explain the convolution for discrete Linear Time Invariant System in brief. **5**

(b) State the computational requirements of Fast Fourier Transform. **5**

(c) Draw the neat and clean flow graph for 8 points Decimation in Frequency Fast Fourier Transform. **5**

2. (a) Describe the various steps for designing of IIR filters using bilinear transformation technique with necessary mathematical analysis. **5**

(b) Determine digital filter system function H(z) using impulse invariance technique for analogy system function $H(s) = \frac{1}{(s+1)(s+2)}$ assuming T = 1s. **5**

(c) Discuss the requirements for converting a stable analog filter into stable digital filter. **5**

Unit II

3. (a) Draw neat and clean diagram for direct form I and II realization for IIR systems with necessary mathematical analysis. **5**

(b) Develop a parallel realization structure of the system characterized by the transfer function $H(z) = \frac{(1+z^{-1})}{\left(1+\frac{1}{2}z^{-1}\right)\left(1+\frac{1}{2}z^{-1}+\frac{1}{4}z^{-2}\right)}$. **5**

(c) Obtain a cascade realization structure of the system characterized by the transfer function $H(z) = \frac{2(z+1)}{z(z-1)(z+0.5)(z+0.4)}$. **5**

4. (a) Draw neat and clean diagram for direct form and cascade realization structure of FIR systems with necessary mathematical analysis. **5**

(b) Describe the finite word length effect on design of digital filter. **5**

(c) Develop the direct form and cascade form of FIR filter described by : **5**

$$H(z) = \left(1-\frac{1}{4}z^{-1}+\frac{3}{8}z^{-2}\right)\left(1-\frac{1}{8}z^{-1}+\frac{1}{2}z^{-2}\right).$$

Unit III

5. (a) Write a brief note on various components of digital image processing system. **5**

(b) Explain the concept of sampling and quantization in image processing. **5**

(c) Define the following terms : **5**

(i) Binary Image

(ii) Resolution

(iii) Pixel

(iv) Color Image

(v) Grey-Scale Image.

6. (a) Define Neighbours of a pixel. **2**

(b) Explain image negative transformation. **2**

(c) Explain log, gamma and piecewise linear transformation function in image along with application of each transformation. **6**

(d) With an example, explain the concept of histogram equalization. **5**

Unit IV

7. (a) Explain image smoothing using ideal low pass filters and Butterworth low pass filters. **5**

(b) State 2D sampling theorem and explain about aliasing in images. **5**

(c) Define 2D DFT. Describe any *five* properties of two dimensional DFT. **5**

8. (a) Describe any *two* sharpening frequency domain filters. **5**

(b) Explain any *two* low pass frequency domain filters. **5**

(c) Discuss, how the various filter masks are generated to sharpen images in spatial filters ? **5**

9. (a) Distinguish between IIR and FIR filters. **3**

(b) List the various building blocks for realization of digital filter. **3**

(c) Discuss the various operations on discrete time signal with example. **3**

(d) Define an image. List out and explain the various areas of applications of image processing. **3**

(e) Define spatial convolution and explain its use in image processing. **3**