Code: EE6T1

III B.Tech - II Semester – Regular/Supplementary Examinations March - 2020

DIGITAL SIGNAL PROCESSING
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer *all* the questions.   All questions carry equal marks

11x 2 = 22 M

1.
   a) What is the condition for stability of an LTI system?
   b) What are the number of computations required for the direct computation of N-point DFT?
   c) Discuss about recursive system.
   d) Discuss the relation between digital and analog frequencies in bilinear transformation.
   e) What are the characteristics of FIR digital filters?
   f) List the applications of multirate signal processing.
   g) Explain briefly about Overlap add and overlap save method.
   h) Draw the frequency domain characteristics of ideal frequency selective filters.
   i) Write short notes on Bartlett window.
   j) Explain sub band coding.
   k) Write short notes on multirate signal processing.

PART – B

Answer any *THREE* questions. All questions carry equal marks.

$$3 \times 16 = 48 \text{ M}$$

2. a) Find out the linear convolution of

$$x(n) = \{1, 2, 3, -6\} \ with \ h(n) = \{2, 1, -1, 3, \ 5\}. \quad 10 \text{ M}$$

b) Determine the ROC of aX(z)+bY(z). Given that

$$X(Z) = \frac{z}{(z-o.4)(z-1.6)} , 0.4 < |Z| < 1.6$$

$$Y(z) = \frac{0.15Z}{(z-0.15)(z-0.5)} , |z| > 0.5$$

For what relationship between a and b the ROC will be the largest? 6 M

3. a) Use radix-2 DIF FFT algorithm to determine DFT of the following sequence

$$x(n) = [1, -1, 1, -1, 1, -1, 1, -1]. \quad 8 \text{ M}$$

b) If $x(n) = \cos\left(\frac{\pi}{2}n\right)$, calculate the 4 point DFT of x(n).

8 M

4. a) Use the analog transfer function $Ha(s) = \frac{2}{(s+1)(s+2)}$,

determine $H[z]$ if T= 1 sec by means of Impulse Invariance method. 8 M

b) Compare IIR and FIR filters. 8 M

5. a) Construct the cascade and parallel form of realization for

$$X(z) = \frac{(1-z^{-1})^3}{\left(1-\frac{1}{2}z^{-1}\right)\left(1-\frac{1}{8}z^{-1}\right)}.$$
8 M

b) Demonstrate an FIR digital low pass filter with a cutoff frequency of 1 KHz and a sampling rate of 5 KHz using Blackman window with N=7. 8 M

6. a) Discuss the function of the following with relevant equations. 8 M
   i) Decimation by a factor D
   ii) Interpolation by a factor I

b) Analyze the multi-stage implementation of a 32-fold decimator by the block diagram. 8 M