(Please write your Exam Roll No.) Exam Roll No. .....

END TERM EXAMINATION

FIFTH SEMESTER [B.TECH] NOVEMBER –DECEMBER 2019

Paper Code: IT 307 **Subject: Digital Signal Processing**

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

Note: Attempt any five questions including Q. No. 1 which is compulsory. Assume missing data if any.

Q1. a) Compare between DFT and FFT. **(5)**

b) Define linearity and shift invariance properties of the discrete time systems verify there conditions for the following systems: **(5)**

i) $T[x(n)] = \sum_{k=-n_0}^{n} x^{(k)}$ ii) T[x[n]]= $e^{x(n)}$

c) Describe methods for finding Inverse Z- bantam. **(5)**

d) Discuss the design for FIR differentiator. **(5)**

e) Compare FIR and IIR system. **(5)**

Q2. a) Discuss the Z-transform theorems and properties. **(6)**

b) Perform linear convolution for the input sequence:- X(n)= {1, 2,3,1,4} and h(n)={ 1,2,3,4}. **(6.5)**

Q3. a) Explain DFT. Prove the following properties of DFT when x(k) is the N-point. **(6)**
i) If x(n) is real and odd.
ii) If x(n) is imaginary and odd.

b) Determine the Z-transform of the following sequences and give their region of convergence: **(6.5)**

i) $\left(\frac{1}{2}\right)^n u(n)$ ii) $\left(\frac{1}{2}\right)^n (u(n)-u(n-10)$

Q4. Explain decimation in-time FFT algorithm for computing DFT. Compute DFT for the sequence {1,4,8,6,3,5,6,2} using FFT algorithm. **(12.5)**

Q5. a) Give the symmetry properties of the DFT of a complex sequence and explain them. **(6)**

b) What are the sample-hold circuits? Explain with the help of an example. **(6.5)**

Q6. a) Discuss the frequency response of the discrete-time system. **(6)**

P.T.O.

b) A casual linear shift invariant filter system has the system function. **(6.5)**

$$H(z) = \frac{1+0.875Z^{-1}}{(1+0.2Z^{-1}+0.9Z^{-2})(1-0.7Z^{-1})}$$

Draw the signal flow graph using

i) Direct form –II
ii) Cascade of the first and second order systems in transposed direct form II.

Q7. Implement the all pass filter $H_a P(Z) = \frac{-0.5120Z^{-1}-0.8Z^{-2}+Z^{-3}}{1-0.8Z^{-1}+0.6402Z^{-2}-0.512Z^{-3}}$ using a lattice filter structure. **(12.5)**

Q8. a) How digital filter specification are given? Explain with the help of magnitude response specifications. **(6)**

b) Explain the process of IIR filter design using a bilinear transformation. **(6.5)**

Q9. Discuss the cascade, parallel and transposed terms of the IIR filter structure. **(12.5)**

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