TEC-502 1064

Odd Semester Examination 2018-19

B.TECH. (EEE/EN) (SEMESTER-V)

DIGITAL SIGNAL PROCESSING

Time: 03:00 Hours **Max Marks : 100**

Note: All Questions Are Compulsory.

1. Attempt **any four** of the following: [4 x 5= 20]

   (a) State the condition for a digital filter to be causal and stable?

   (b) State the necessary and sufficient condition for the stability of LTI systems.

   (c) Show that the output of an LTI system can be expressed in term of its unit impulse response.

   (d) For each impulse response determine the system is i) stable ii) causal

   (i) $h(n) = \delta(n) + \sin \pi n$

   (ii) $h(n) = 2^n u(-n)$

   (e) Find the convolution $x(n) * h(n)$, where $x(n) = a^n u(n)$, $h(n) = \beta^n u(n)$

2. Attempt **any four** of the following: [4 x 5= 20]

   (a) Differentiate between DIT and DIF FFT algorithm.

   (b) Obtain direct cascade realization of the system $H(Z) = (1+5Z^{-1}+6Z^{-2})(1+Z^{-1})$.

   (c) Prove that an FIR filter has linear phase if the unit sample response satisfy the condition $h(n)=h(N-1-n)$

   (d) Why impulse invariant method is not preferred in the design of high pass IIR filter?

   (e) Draw the butterfly operation in DIT and DIF algorithm?

3. Attempt **any two** of the following: [2 x 10 =20]

(a) What is the reason that FIR filters are always stable? Also write the properties of FIR filter.

(b) Write on optimum approximation of FIR filters?

(c) Draw the direct form implementation of the FIR system having difference equation $y(n) = x(n)-2x(n-1)+3x(n-2)-10x(n-6)$

4. Attempt **any two** of the following: [2 x 10 =20]

(a) Write short notes on Walsh and Hardmard Coding.

(b) Convert the analog filter $H(s) = 0.5\ (s+4) / (s+1)(s+2)$ using impulse invariant transformation $T=0.31416s$

(c) Derive bilinear transformation for an analog filter with system function $H(s) = b/(s+ a)$

5. Attempt **any two** of the following: [2 x 10 =20]

(a) Develop a decimation-in-frequency FFT algorithm for N = 8.

(b) Compute the DFT of the sequence $x(n)= [\ 1\ 0\ 10\ 1\ 0\ 1\ 0]$ using DIT FFT algorithm.

(c) What are the application of adaptive filtering to echo cancellation and equalization.

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