(b) What is FFT algorithm ? Given $x(n) = (0, 1, 2, 3)$

Find x(k) using DIT FFT algorithm. (10)

7. (a) Determine the parallel realisation of IIR filter transfer function : (10)

$$H(z) = \frac{3(2z^2 + 5z + 4)}{(2z + 1)(z + 2)}$$

(b) Discuss the issues connected with finite word length effects. Discuss the errors resulting from rounding and truncation in binary number representation. (10)

8. Write short notes on (any **two**) : (10,10)

(a) Design of LP filters using impulse invariance method

(b) DIF FFT algorithm

(c) Initial value and Final Value theorem for Z transform

Roll No. .....

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M. E. 1st Semester Electronics & Communication Engg. Examination– December, 2016

ADVANCED DIGITAL SIGNAL PROCESSING

Paper : MEEC-507

Time : 3 hours ***Max. Marks : 100***

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

Note: Attempt any **five** questions. All questions carry equal marks.

1. Determine whether system described by the following input-output equations are : (20)

(a) Linear

(b) Time invariant

(c) Stable

(d) Causal

(i) $y(n) = nx(n)$

(ii) $y(n) = ax(n) + b$

(iii) $y(n) = e^{x(n)}$

(iv) $y(n) = x(n)\ \mathrm{Sin}(W_o n)$

2. (a) Determine the output y(n) of a relaxed LTI system with impulse response

$h(n) = a^h u(n),\ |a| < |$

where input is a unit step sequence. (10)

(b) State and prove Parseval's theorem for Fourier Transform. (10)

3. (a) Find Fourier Transform of following signals : (4×3=12)

(i) $x(n) = \begin{cases} 1 & 0 \le h \le 6 \\ 0 & \text{otherwise} \end{cases}$

(ii) $x(n) = \left(\frac{1}{2}\right)^h u(n-5)$

(iii) $x(n) = \delta\ (n-5)$

(b) State the following properties of Fourier Transform (4×2=8)

(i) Duality

(ii) Convolution

4. State and explain various properties of Z-transform

(a) Determine inverse Z-transform of following function. (10)

(b) Determine inverse Z-transform of the following function : (10)

(i) $X(z) = \frac{1}{1 - 1.5Z^{-1} + 0.5Z^{-2}}$

(ii) $\frac{1}{(1+z^{-1})(1-z^{-1})^2}$

5. Explain the design of IIR filters by :

(a) Approximation of derivatives. (10)

(b) Explain the procedure of designing an FIR filter using window functions. (10)

6. Define DFT for a sequence x(n). Determine the DFT of the sequence : (10)

(a) $x(n) = \begin{cases} \frac{1}{5}, & \text{for } -1 \le n \le 1 \\ 0, & \text{otherwise} \end{cases}$