

Roll No.....

**EC - 603**

**B.E. VI Semester**

Examination, June 2015

**Digital Signal Processing**

*Time : Three Hours*

*Maximum Marks : 70*

- Note:** i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.
- ii) All parts of each questions are to be attempted at one place.
- iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.
- iv) Except numericals, Derivation, Design and Drawing etc.

**Unit-I**

1. a) Compute N-point DFT of unit sample  $\delta(n)$ .
- b) An analog signal is sampled at 15 KHz and 1024 point DFT is computed. Determine the frequency spacing between spectral samples of DFT.
- c) If  $x(n)$  and  $X(k)$  be the DFT pair, prove that  $X(k)$  obey periodicity property.
- d) State and prove Symmetry and Periodicity property of Twiddle factor.

OR

Discuss computational complexity of direct computation of N-point DFT in terms of complex multiplications, addition and real multiplications and additions.

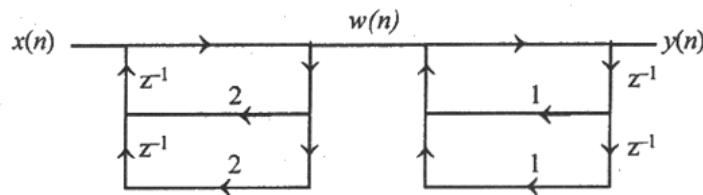
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**Unit-II**

2. a) Draw and explain Traversal filter.
- b) How direct form I structure differs from direct form II structure?
- c) A difference equation describing a filter is given below, find out filters transfer function also show : - Does this  $H(z)$  represent a FIR or IIR filter. Why?

$$y(n) - \frac{3}{4}y(n-1) + \frac{1}{8}y(n-2) = x(n) + \frac{1}{2}x(n-1)$$

- d) For the flow graph given below write difference equation and system function.



OR

Write Tellegen's theorem for digital filter and its applications.

**Unit-III**

3. a) How do we map from S plane to Z plane in bilinear transformation?
- b) How do we obtain causal FIR filters.
- c) State and prove condition of phase linearity for FIR filter.
- d) Explain frequency sampling method of FIR filter design.

OR

Make comparison between FIR and IIR filter.

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**Unit-IV**

4. a) Explain that Goertzel algorithm is based on linear filtering approach.
- b) How discrete time and frequency indexes are decoupled in chirp Z-transform?
- c) Prove that in DIT-FFT algorithm input appears in bit reversed order.
- d) What are the advantages of FFT over DFT's? Also draw butterfly diagram for DIF-FFT algorithm and explain.

OR

Classify FFT algorithm and explain each of them in brief.

**Unit-V**

5. a) What are the limitations of non-parametric method.
- b) What is energy spectral density?
- c) Prove that time average autocorrelation function is an estimate of the statistical autocorrelation function.
- d) Write different properties of autocorrelation function.

OR

Write short note on power spectral estimate.

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