d) Realize the FIR filter transfer function :

$H(z) = (1 + 0.4Z^{-1})^4$ in

i) Cascade of first order section

ii) Two different direct forms

OR

Write short note on Butterworth and Chebyshev analog filter approximations.

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Total No. of Questions :5] *[Total No. of Printed Pages : 4*

Roll No .....

EX-703

B.E. VII Semester

Examination, December 2016

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 question 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.

v) Assume suitable data if required.

1. a) Draw and explain the graphical representation of Discrete Time Signal.

b) What do you understand by complex sequences? Explain.

c) Explain the concept of signal manipulations. Also explain the transformation of Independent variable.

d) A linear system is one that is both homogeneous and additive.

i) Give an example of a system that is homogeneous but not additive.

ii) Give an example of a system that is additive but not homogeneous.

OR

Find the output $y(n)$ of a causal discrete time LTI system which is characterized by difference equation : $y(n)-3/4\ y(n-1)+1/8\ y(n-2)=2x(n)$ for the input: $x(n)=(1/4)^n u(n)$.

2. a) Derive and explain the Linearity and Shifting property of DTFT with Z transform.

   b) Find the z-transform of $x(n)=n\alpha^n\ u(-n)$.

   c) Derive the relation for the contour Integration.

   d) Consider the linear constant coefficient difference equation $y(n) = 0.25\ y(n-2)+x(n)$. Find the solution to this equation assuming that $x(n)=\delta(n-1)$ with $y(-1) = y(-2) = 1$.

OR

The Z-transform of a particular discrete time signal $x(n)$ is expressed as : $X(Z) = 1+1/2\ Z^{-1}/\ 1-1/2\ Z^{-1}$ determine $x(n)$ using time shifting property.

3. a) Derive a relation for Periodic Convolutions with DFS coefficients.

   b) Define DFT. Prove its necessary derivations.

   c) Explain the circular property of DFT with example.

   d) What do you understand by Radix of FFT algorithm find the number of commutations required for 2048 point DFT using normal method.

OR

Compute the N-point DFT of each of the following sequences :

i) $x_1(n) = \delta(n)$

ii) $x_2(n) = \delta(n-n_0)$ where $0 < n_0 < N$

iii) $x_3(n) = \alpha^n\ \ 0 < n < N$

iv) $x_4 = u(n) - u(n - n_0)$, where $0 < n_0 < N$

4. a) Explain the concept of Digital Networks.

   b) Derive the supportable structures for FIR systems.

   c) Derive a frequency sampling structure with N point DFT of an FIR filter.

   d) Explain the designing of IIR filter by bilinear transformation method with the help of suitable example. Derive its relations also.

OR

Convert the analog filter with system function :

$$Ha(s) = \frac{s + 0.1}{(s + 0.1)^2 + 9}$$

Into an IIR digital filter by means of the impulse invariance method.

5. a) Derive and explain the Transposition Theorem.

   b) What are the advantages and disadvantages of FIR filter?

   c) Explain the consequences of Window Technique use to design FIR Digital Filters.