B.Tech III Year II Semester (R13) Regular Examinations May/June 2016

DIGITAL SIGNAL PROCESSING

(Common to ECE and EIE)

Time: 3 hours Max. Marks: 70

PART – A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Define energy & power signals.
(b) Consider a finite duration sequence X(n) = {2, 4, 0, 3}.Resolve the sequence into sum of weighted impulses.
(c) What is FFT?
(d) Draw the direct form-II realization of two people resonator from Goertzel algorithm.
(e) Define signal flow graph.
(f) Draw the direct form-I realization structure of IIR filter.
(g) What is realization.
(h) Distinguish between Recursive & non recursive realization.
(i) Define the terms decimation and Interpolation.
(j) What are the applications of multi rate signal processing?

PART – B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2 Explain about classification of discrete time systems briefly.

OR

3 (a) Discuss about linearity, periodicity properties of DFT.
(b) Perform circular convolution of two sequences given by $X_1(n) = \{1, 2, 3, 4\}$ $X_2(n) = \{-1, 3, -5, 7\}$.

UNIT – II

4 Implement the decimation in time FFT algorithm for N = 16.

OR

5 Write short notes on the following: (i) Split-radix FFT. (ii) Applications of Goertzel algorithm. (iii) Quantization errors. (iv) Radix -4 FFT Algorithm. (v) Chirp-Z transforms.

UNIT – III

6 Obtain the direct form-I, direct form-II, cascade and parallel realization for the following system:

$Y(n) = -0.1y(n-1) + 0.2y(n-2) + 3x(n) + 3.6x(n-1) + 0.6x(n-2)$

OR

7 (a) Determine the direct form-II and transposed direct form –II for the given system:

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

(b) An FIR filter is given by the difference equation:

$y(n) = 2x(n) + \frac{4}{5}x(n-1) + \frac{3}{2}x(n-2) + \frac{2}{3}x(n-3)$. Determine its Lattice form.

UNIT – IV

8 Design a digital Butterworth filter satisfying the following constrains:

$0.707 \leq |H(e^{jw})| \leq 1$ for $0 \leq \omega \leq \pi/2$

$|H(e^{jw})| \leq 0.2$ for $3\pi/2 \leq \omega \leq \pi$

With T = 1sec using bilinear transformation.

OR

9 Design a filter with:

$Hd(e^{jw}) = e^{-j3w} \quad -\pi/4 \leq w \leq \pi/4$

$= 0 \quad \pi/4 < w \leq \pi/4$ using Hamming window with N = 7.

UNIT – V

10 Sketch the following signals:

$X_1(n) = n, \quad n > 0$
$= 0 \quad$ otherwise
$X_2(n) = n^2, \quad n > 0$
$= 0 \quad$ otherwise

Also sketch decimator and interpolated version of above systems with a factor of '2'.

OR

11 With the help of block diagram explain in detail about multistage implementation of sampling rate conversion by rational factor I/D.

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