

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)

- 1 Answer the following: (10 X 02 = 20 Marks)
- Define energy & power signals.
 - Consider a finite duration sequence $X(n) = \{2, 4, 0, 3\}$. Resolve the sequence into sum of weighted impulses.
 - What is FFT?
 - Draw the direct form-II realization of two people resonator from Goertzel algorithm.
 - Define signal flow graph.
 - Draw the direct form-I realization structure of IIR filter.
 - What is realization.
 - Distinguish between Recursive & non recursive realization.
 - Define the terms decimation and Interpolation.
 - 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:
 $0.707 \leq |H(e^{j\omega})| \leq 1$ for $0 \leq \omega \leq \pi/2$
 $|H(e^{j\omega})| \leq 0.2$ for $3\pi/2 \leq \omega \leq \pi$
With $T = 1$ sec using bilinear transformation.

OR

- 9 Design a filter with:
 $H_d(e^{j\omega}) = e^{-j3\omega}$ $-\pi/4 \leq \omega \leq \pi/4$
 $= 0$ $\pi/4 < \omega \leq \pi/4$ using Hamming window with $N = 7$.

UNIT – V

- 10 Sketch the following signals:
 $X_1(n) = n, n > 0$
 $= 0$ otherwise
 $X_2(n) = n^2, n > 0$
 $= 0$ 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 .
