Code: 13A04602

R13

B.Tech III Year II Semester (R13) Supplementary Examinations December 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) What is meant by signal processing?

(b) If X(k) is the DFT of a sequence x(n), then what are DFT of only real part of x(n) and DFT of only imaginary part of x(n)?

(c) What is the main advantage of FFT?

(d) How many multiplications and additions are required to compute N-point DFT using radix-2 FFT?

(e) What is the non-recursive system?

(f) When does a cascade form realization is preferred in FIR filter?

(g) Give the bilinear transformation equation between s-plane and z-plane.

(h) What is the need for employing window technique for FIR filter design?

(i) What is meant by multi rate signal processing?

(j) What is the effect of upsampling and down sampling?

PART – B

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

UNIT – I

2 Find the response of the system described by the difference equation y(n) + 2y(n-1) + y(n-2) = x(n) + x(n-1) for the input $x(n) = (\frac{1}{2})^n u(n)$, with initial conditions y(-1) = y(-2) = 1.

OR

3 Determine and sketch the magnitude and phase response of $y(n)=\frac{1}{2}[x(n) + x(n-2)]$.

UNIT – II

4 Find the DFT of the sequence x(n) = {1,2,3,4,4,3,2,1} using radix-2 DIT-FFT algorithm.

OR

5 (a) Explain in detail about Goertzel algorithm.

(b) Explain about Quantization errors in the computation of DFT.

UNIT – III

6 (a) Discuss about signal flow graph and transposed structure.

(b) Determine the transposed direct form II for the given system: $y(n) = \frac{1}{2}y(n-1) - \frac{1}{4}y(n-2) + x(n) + x(n-1)$.

OR

7 (a) Obtain the cascade realization of system function: $H(z) = (1 + 2z^{-1} - z^{-2})(1 + 2z^{-1} - z^{-2})$.

(b) Discuss about Lattice structures of an FIR filer.

UNIT – IV

8 Design a filter with:

$$H_d = (e^{jw}) = e^{-j3w} \quad \text{for} \quad -\frac{\Pi}{4} \leq w \leq \frac{\Pi}{4}$$
$$= 0 \quad \text{for} \quad \frac{\Pi}{4} \leq w \leq \Pi$$

Using a Hamming window with N = 7.

OR

9 Design a third order Butterworth digital filter using impulse invariant technique. Assume sampling period T = 1 sec.

UNIT – V

10 (a) Upsampler and Down sampler are time variant or invariant systems. Explain.

(b) Discuss about aliasing effect.

OR

11 (a) Explain multistage implementation of sampling rate conversion.

(b) Write the advantages of multirate signal processing.

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