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Code: 15A04603 **R15**

B.Tech III Year II Semester (R15) Regular Examinations May/June 2018

DIGITAL SIGNAL PROCESSING

(Common to ECE & 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 the DFT of $x(n) = \delta(n) + \delta(n-2)$?

(b) What is the relation between DFT and Z transform?

(c) What is meant by radix 4 FFT?

(d) Mention the advantage of FFT algorithms.

(e) What is the main disadvantage of direct form realization?

(f) Sketch the signal flow graph for a first order IIR digital filter.

(g) Mention two advantages of FIR filter.

(h) What is the relation between S and Z plane per Bilinear transformation?

(i) Mention few applications of multi rate sampling.

(j) What is the use of anti imaging filter in the interpolator?

PART – B

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

UNIT – I

2 Compute the 4 point DFT of the sequence x(n) = {1, 1, -1, -1}.

OR

3 State and prove the linearity and circular frequency shift property of DFT.

UNIT – II

4 Compute the 8 point DFT of the sequence x(n) = {5, 0, 1-j, 0, 1, 0, 1+j, 0} using DIT-FFT algorithm.

OR

5 Explain the Chirp Z transform algorithm for computation of DFT.

UNIT – III

6 A 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.

OR

7 Obtain the parallel form of realization for the IIR system:

$$y(n) = -0.1\,y(n-1) + 0.72\,y(n-2) + 0.7\,x(n) - 0.252\,x(n-2)$$

UNIT – IV

8 Design a low pass FIR filter using the Hanning window for which the desired frequency response is:

$$H_d(w) = \begin{cases} e^{-jw\alpha}, & |\omega| \le \omega_c \\ 0, & else\ where \end{cases}$$

The length of filter is 7 and $\omega_c = 1\ rad/sec$.

OR

9 Design a digital low pass Chebyshev filter with an acceptable passband ripple of 2dB, cut off frequency of 1 rad/sec and stop band attenuation of 20dB or greater beyond 1.3 rad/sec. Use bilinear transformation and assume T = 1 sec.

UNIT – V

10 Describe the process of decimation. With necessary equations, explain the spectrum of the decimated signal.

OR

11 (a) Explain with block diagram for sampling rate conversion by an arbitrary factor.

(b) Explain sampling rate conversion of bandpass signals.

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