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B.E. / B.Tech (Full Time) DEGREE END SEMESTER EXAMINATIONS, APRIL / MAY 2011

ELECTRONICS AND COMMUNICATION ENGINEERING BRANCH

FIFTH SEMESTER

EC 9304 – DIGITAL SIGNAL PROCESSING

(REGULATIONS 2008)

Time: 3 Hours Max. Marks:100

Answer all Questions

PART-A **(10 x 2 = 20 Marks)**

1) State the Sampling Theorem.
2) State any two DFT properties.
3) When an FIR filter is said to be a linear phase FIR filter?
4) Mention the important properties of Butterworth filter.
5) Differentiate IIR filters and FIR filters.
6) Why mapping is needed in the design of digital filters?
7) What are the quantization errors due to finite word length registers in digital filters?
8) Give the expression for signal to quantization noise ratio and calculate the improvement with an increase of 2 bits to the existing bit.
9) Mention the usage of digital decimator system in signal processing.
10) List the practical applications of multi-rate signal processing technique.

PART-B **(5 x 16 = 80 Marks)**

11) (a) Find the output y(n) of a filter whose impulse response is h(n) = {1, 1, 1} and input signal x(n) = {3, -1, 0, 1, 3, 2, 0, 1, 2, 1} using Overlap add and Overlap save method. (16)

12) (a) Convert the analog filter with system transfer function $H_a(S) = S + 0.1 / (S+0.1)^2 + 25$ Filter using bilinear transformation method. (16)

(or)

(b) Design band reject filter with a frequency response (16)

$H_d(e^{jw}) = 1$ for $\pi/4 <= |w| <= 3\pi/4$

0 otherwise

Find the value of h(n) for N=11 and find H(Z) plot magnitude response.

13)

(a) Explain the principle and procedure for designing FIR filter using rectangular window. (16)

(or)

(b) Design and implement linear phase FIR filter of length N =15 which has following unit sample sequence, $H(k) = 1$; for $k = 0, 1, 2, 3$ (16)

0 ; for $k = 4, 5, 6, 7$

14)

(a) Describe the effects of quantization in IIR filter. Consider a first order filter with difference equation $y(n) = x(n)+0.5\ y(n-1)$. Assume that the data register length is three bits plus a sign bit. The input $x(n) = 0.875\ \delta(n)$. Explain the limit cycle oscillations in the above filter, if quantization is performed by means of rounding and signed magnitude representation is used. (16)

(or)

(b) Explain in detail about the special purpose Harvard architecture and pipelining process of the digital signal processor. (16)

15) (a) (i) Explain the interpolation of sampling rate by an integer factor 'D' and derive spectra for decimal signal. (8)

(ii) Analyze in detail about the sampling rate conversion effects in a digital system. (8)

(or)

(b) Design a scheme for reducing the sampling rate of a signal to 0.75 of its original sampling frequency. Sketch the magnitude of the frequency response of any filters employed. (16)