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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 373 – DIGITAL SIGNAL PROCESSING

(REGULATIONS 2004)

Time: 3 Hours Max. Marks:100

Answer all Questions

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

1) Define LTI system.
2) Write the difference between overlap-add and overlap-save methods.
3) State the reason, why analog filter design is important in the digital signal processing technique.
4) Mention the important properties of Chebyshev filter.
5) Distinguish between FIR and IIR filters.
6) Why rectangular window are not used in FIR filter design using window method?
7) Brief on co-efficient inaccuracy.
8) What do you understand by input quantization error?
9) Mention the usage of digital interpolator system in signal processing.
10) List the practical applications of multi-rate signal processing technique.

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

11) (a) Compute the DFT of each of the following finite-length sequences considered to be of length N.

(i) $x(n) = \delta(n)$ (8)

(ii) $x(n) = \delta(n - n_0)$, where $0 < n_0 < N$ (8)

12) (a) The normalized transfer function of an analog filter is given by, (16)

$$H_a(s_n) = \frac{1}{s_n^2 + 1.41 s_n + 1}$$

with a cutoff frequency of 0.4 π. using bilinear transformation.

(or)

(b) For a given specifications of the desired low pass filter given below, (16)

$0.707 \leq |H(\omega)| \leq 1.0, \quad 0 \leq \omega \leq 0.2\pi$

$|H(\omega)| \leq 0.08, \quad 0.4\pi \leq \omega \leq \pi,$

design a Butterworth filter using bilinear transformation.

13)

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

(or)

(b) (i) Determine the direct form of following system (8)

$H(z) = 1 + 2z^{-1} - 3z^{-2} + 4z^{-3} - 5z^{-4}$

(ii) Obtain the cascade form realizations of FIR systems (8)

$H(z) = 1 + 5/2\ z^{-1} + 2z^{-2} + 2\ z^{-3}$

14)

(a) (i) Derive the truncation error and round off error noise power and compare both errors. (8)

(ii) Explain product quantization error and coefficient quantization error with examples. (8)

(or)

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

15) (a) (i) Explain the decimation 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) Given a filter $H(z) = 1+ 2z^{-1} + 3z^{-2} + 4z^{-3}$, decompose this filter using type 1 polyphase decomposition into two filters $E_0(z)$ and $E_1(z)$. Sketch the signal flow graph for both the original filter and the polyphase filter. (16)