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Question Paper Code : 60453

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2016.

Fifth Semester

Electronics and Communication Engineering

EC 2302/EC 52 — DIGITAL SIGNAL PROCESSING

(Regulations 2008)

(Common to PTEC 2302 – Digital Signal Processing for B.E. (Part-Time) Fourth Semester – Electronics and Communication Engineering — Regulations 2009)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What is zero padding? What is the purpose of it?

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

3. Why do we go for analog approximation to design a digital filter?

4. Give any two properties of chebyshev filters.

5. State the effect of having abrupt discontinuity in frequency response of FIR filters.

6. State Gibb's phenomenon.

7. What are the two types of quantization employed in digital system?

8. Define zero input limit cycle oscillations.

9. Define decimator and interpolator.

10. List the applications of multi rate signal processing.

PART B — (5 × 16 = 80 marks)

11. (a) Explain in detail about overlap add method and overlap save method for filtering of long data sequences using DFT. (16)

Or

(b) Develop a 8 point DITFFT algorithm. Draw the signal flow graph. Determine the DFT of the following sequence.

$x(n)=\{1, 1, 1, 1, 0, 0, 0, 0\}$ using the signal flow graph. Show all the intermediate results on the signal flow signal. (16)

12. (a) Discuss the steps in the design of IIR filter using Bilinear transformation for any one type of filter. (16)

Or

(b) Convert the following pole-zero IIR filter into a lattice ladder structure.

$$H(z)=\frac{\left[1+2z^{-1}+2z^{-2}+z^{-3}\right]}{\left[1+\left(\frac{13}{24}\right)z^{-1}+\left(\frac{5}{8}\right)z^{-2}+\left(\frac{1}{3}\right)z^{-3}\right]}.$$ (16)

13. (a) (i) Determine the frequency response of FIR filter defined by $y(n)=0.25x(n)+x(n-1)+0.25x(n-2)$.

Calculate the phase delay and group delay. (8)

(ii) Discuss the design procedure of FIR filter using frequency sampling method. (8)

Or

(b) Design a FIR filter with the following desired specification

$$H_d\left(e^{jw}\right)=\begin{cases}0, & \frac{-\pi}{4}\le\omega\le\frac{\pi}{4}\\ e^{-j2\omega}, & \frac{\pi}{4}\le|\omega|\le\pi\end{cases}$$

using a Hanning window with N = 5.

14. (a) Explain the quantization process and errors introduced due to quantization. (16)

Or

(b) (i) Explain how reduction of product round-off error is achieved in digital filters. (8)

(ii) Explain the effects of coefficient quantization in FIR filters. (8)

15. (a) Explain with block diagram the general poly phase frame work for decimator and interpolator. (16)

Or

(b) Implement a two stage decimator for the following specifications :

Sampling rate of the input signal = 20,000 Hz

M = 100

Passband = 0 to 40 Hz

Transition band = 40 to 50 Hz

Passband ripple = 0.01

Stopband ripple = 0.002. (16)
