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Question Paper Code : 71453

B.E./B.Tech. DEGREE EXAMINATION, APRIL/MAY 2015.

Fifth Semester

Electronics and Communication Engineering

EC 2302/EC 52 — DIGITAL SIGNAL PROCESSING

(Regulation 2008)

(Common to PTEC 2302 – Digital Signal Processing for B.E. (Part-Time) Fourth Semester – ECE – Regulation 2009)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Write the analysis and synthesis equations of DFT.

2. Is the DFT of a finite length sequence periodic? If so, state the theorem?

3. Find $H(z)$ for the IIR filter whose $H(S) = \frac{1}{(s+6)}$ with $T = 0.1$ sec.

4. Draw the response curve for butterworth, chebychev and elliptic filters.

5. Why is window function used in FIR filter design?

6. Draw a causal FIR filter structure for length $m = 5$.

7. Explain briefly quantization noise.

8. List the types of limit cycle oscillalion.

9. State the basic operations of multi-rate signal processing.

10. What is pipelining?

PART B — (5 × 16 = 80 marks)

11. (a) (i) Determine the 8 point DFT of the sequence

$$X(n) = \{0, 0, 1, 1, 1, 0, 0, 0\}$$ (8)

(ii) What is decimation in frequency algorithm? Write the similarities and differences between DIF and DIT algorithms. (8)

Or

(b) With appropriate diagrams discuss how overlap – save method and overlap – add method are used. (16)

12. (a) Explain in detail the steps involved in the design of IIR filter using bilinear transformation. (16)

Or

(b) (i) Convert the analog filter with system function $H_a(s) = \dfrac{s+0.1}{(s+0.1)^2+16}$ into a digital IIR filter by means of the bilinear transformation. The digital filter is to have a resonant frequency of $\omega_r = \dfrac{\pi}{2}$. (10)

(ii) Draw the structure for the IIR filter in direct form – II for the following transfer function. (6)

$$H(z) = \frac{(2+3z^{-1})(4+2z^{-1}+3z^{-2})}{(1+0.6z^{-1})(1+z^{-1}+0.5z^{-2})}$$

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

Or

(b) Design a FIR linear phase digital filter for the response

$$H(\omega) = \begin{cases} 1 \text{ for } |\omega| \le \dfrac{\pi}{6} \\ 0 \text{ for } \dfrac{\pi}{6} < |\omega| \le \pi \end{cases}$$ (16)

14. (a) (i) Explain the various formats of the fixed point representation of binary numbers (8)

(ii) What is meant by finite word length effects on digital filters? List them. (8)

Or

(b) Find the output round off noise power for the system having transfer function $H(z) = \frac{1}{(1-0.5z^{-1})(1+0.4z^{-1})}$ which is realized in cascade form. Assume word length is 4 bits. (16)

15. (a) Explain in detail the two basic operations in multi-rate signal processing. (16)

Or

(b) (i) Draw and explain the block diagram of subband coding system. (8)

(ii) Discuss about the musical sound processing (8)