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Question Paper Code : X 67562

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2020
Fifth Semester
Electronics and Communication Engineering
EC 1302 – DIGITAL SIGNAL PROCESSING
(Regulations 2008)

Time : Three Hours | Maximum : 100 Marks

Answer ALL questions

PART – A **(10×2=20 Marks)**

1. Compute the 4-point DFT of the sequence x[n] = {1, 1, 0, 0}.

2. Compare DIT-FFT and DIF-FFT algorithms.

3. Mention two important features of Butterworth filters.

4. What is the condition for FIR filters to have linear phase ?

5. What is the possible range of numbers in the fixed point-arithmetic ?

6. What is meant by quantization of analog signals ?

7. Define periodogram.

8. What is the goal of power spectrum estimation ?

9. What is the function of parallel logic unit ?

10. What are the addressing modes supported by TMS 320C5X processor ?

PART – B **(5×16=80 Marks)**

11. a) Find the circular convolution of the following two sequences using over lap add overlap save method. **(16)**

$x(n) = (n + 1); 0 \le n \le 9$

$h(n) = (1, 0, -1)$

(OR)

b) Find the DFT of the sequence

$x(n) = \{1, -1, -1, -1, 1, 1, 1, -1)$ using Decimation in time FFT algorithm. **(16)**

12. a) Design an FIR digital low pass filter with desired system function. **(16)**

$H_d(w) = e^{-j3\omega}, 0 \le |w| \le \pi / 3$

$= 0, \quad \pi / 3 \le |w| \le \pi.$

Use Hamming window with N = 7.

(OR)

b) Design an IIR digital low pass filter to meet the following requirements **(16)**

Ripples in passband ≤ 1 dB, Passband cutoff freq. = 4 KHz

Ripples in stopband ≥ 40 dB, Stopband cutoff freq. = 6 KHz

Sample rate = 24 KHz.

Use bilinear trasformation.

13. a) i) Explain limit cycle oscillations. **(6)**

ii) Study the limit cycle oscillations of the system $y(n) = 0.95\ y(n - 1) + x(n)$ where the product is quantized by rounding to 4 bits and sign magnitude representations is used. Also determine the dead band of the system. **(10)**

(OR)

b) i) The input to the system $y(n) = 0.999\ y(n - 1) + x(n)$ is applied to an ADC. What is the output quantization noise power of the filter if the input is quantized to 8 bits ? **(8)**

ii) What is coefficient quantization error ? Explain its effect in digital filters. **(8)**

14. a) i) Let x1(n) and x2(n) be uncorrelated signals. Show that if x(n) = x1(n) + x2(n) then $\mu x = \mu x1 + \mu x2$ and $\sigma_x^2 = \sigma_{x1}^2 + \sigma_{x2}^2$. **(8)**

ii) Write a detailed technical note on the use of DFT in power spectrum estimation. **(8)**

(OR)

b) i) The N-point DFT of a random sequence X(n) is, $X(k) = \sum_{n=0}^{(N-1)} X(n)e^{-j2\pi kn/N}$. Determine the variance and autocorrelation of X(k). **(8)**

ii) Explain the Blackman and Tukey method of power spectrum estimation. **(8)**

15. a) Draw the functional block diagram of TMS32OCSx DSP processor and explain the functions of each block in detail.

(OR)

b) i) Explain how the pipelining is achieved in digital signal processors. **(8)**

ii) Discuss the advanced addressing modes of digital signal processors with its functions. **(8)**

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