Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 20959

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023

Fifth Semester

Electrical and Electronics Engineering

EE 3024 – DIGITAL SIGNAL PROCESSING SYSTEM DESIGN

(Common to Minor Degree)

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Is the system $y(n) = x(n) + 2x(n-1)$ linear and time invariant? Justify.

2. Bring out the difference between analog signal and digital signal.

3. Obtain the circular convolution of $x_1(n) = \{1,2,3\}$ and $x_2(n) = \{-3,1,-2\}$.

4. Compute the Fourier transform of an unit step signal.

5. Find the 4 point of the sequence DFT $x(n) = \{1,1\}$.

6. Compute the number of multiplications and additions for 32 point DFT and FFT.

7. Comment on the pass band and stop band characteristics of Chebyshev Type – I filter.

8. What is meant by prewarping? Conclude what happens, if prewarping is not employed?

9. Justify that DSP Processors are more advantages than microcontrollers.

10. Highlight the features of commercial Digital Signal Processor.

PART B — (5 × 13 = 65 marks)

11. (a) White the mathematical condition for the system to be linear, time varying, causal, and stable. Check the same for the given system $y(n) = nx^2(n)$.

Or

(b) (i) Formulate the concept on sampling techniques in both time domain and frequency domain. (7)

(ii) Interpret the quantization effects in converting analog signal in to digital signal. (6)

12. (a) Find the inverse Z Transform of $X(Z) = 4z/(z+1)^2(z+3)$ for all the possible ROCs.

Or

(b) Find the response of the casual system $y(n) - y(n-1) = x(n) + x(n-1)$ to the input $x(n) = u(n)$. Test is stability.

13. (a) Determine the DFT of a sequence $x(n) =: \{1,1,1,1,1,1,1,0\}$ using radix – 2 DIT – FFT.

Or

(b) Determine the DFT of a given sequence $x(n) = \{1,2,3,4,4,3,2,1\}$ using radix – 2 DIF FFT algorithm.

14. (a) Explain about the various methods that are used for performing analog to digital transformation.

Or

(b) Design a 9 –order non-recursive HPF with a cut off frequency of $w_c = \frac{\pi}{2}$ rad using Hamming window.

15. (a) Draw the functional block diagram of a digital signal processor and explain.

Or

(b) Illustrate the different addressing modes supported by the Digital Signal Processor with suitable example.

PART C — (1 × 15 = 15 marks)

16. (a) With neat sketches, explain how a digital signal processor can be used to control the motor speed.

Or

(b) Explain how an FIR bitter could be implemented using digital signal processor.

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