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

Question Paper Code: 46424

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2022

Sixth Semester

Electrical and Electronics Engineering

14UEC624 - APPLIED DIGITAL SIGNAL PROCESSING

(Regulation 2014)

(Common to EIE and ICE branches)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. The system y (t) =3x (t) +5 is a _____ system.

   (a) Non-linear (b) Dynamic (c) Non-Causal (d) unstable

2. Integration of step signal results in _____ signal.

   (a) ramp (b) delta (c) Sinusoidal (d) triangular

3. The LTIDT system with system function $h(n)=a^n u(n)$ is stable, only if

   (a) $a>1$ (b) $1/a<\infty$ (c) $a<\infty$ (d) $a<1$

4. Convolution in time domain is equal to _____ in frequency domain.

   (a) addition (b) multiplication (c) compression (d) expansion

5. The phase factors are multiplied before the add and subtract operations in

   (a) DIT Radix 2 FFT (b) DIF Radix 2 FFT
   (c) Inverse DFT (d) Both (a) and (c)

6. Compute the X(0) of the sequence x(n)={1, 0, 1, 0, 1, 0, 1, 0}

   (a) 8 (b) 4 (c) 2 (d) 1

7. The condition for linear phase characteristic in FIR filter is, the impulse h(n)=_____ where N is the duration of the sequence.

(a) h(n+N-1) (b) h(N+1-n) (c) h(N-1-n) (d) h(n-N-1)

8. When s=_____ LPF is converted to HPF in analog domain.

(a) $\frac{s}{\Omega_c}$ (b) $\frac{\Omega_c}{s}$ (c) $s\Omega_c$ (d) s^2

9. The pipeline depth of TMS320C50 is

(a) 6 (b) 4 (c) 2 (d) 0

10. The function of wait-state generator is

(a) To insert wait-state in internal and external bus cycles
(b) To insert wait-state in data memory cycles
(c) To insert wait-state in program memory cycles
(d) To insert wait-state in external bus cycles

PART - B (5 x 2 = 10 Marks)

11. Is the system y(n) = x(-n) time invariant or not.

12. State Parseval's relations in Z transform.

13. List any two properties of DFT.

14. What is the necessary and sufficient condition for linear phase characteristic in FIR filter?

15. What is pipelining?

PART - C (5 x 16 = 80 Marks)

16. (a) Show that unit impulse response can be used to obtain the response for any input for an LTI system. Also, determine whether the following systems are linear, time-invariant and causal.

(i) y(t) = x(t/3)
(ii) y(n) = x(-n)
(iii) $y(t) = x(t^2)$
(iv) $y(n) = x^2(2n)$ (16)

Or

(b) State and prove sampling theorem for low pass band limited signal and explain the process of reconstruction of the signal from its samples. (16)

17. (a) Using residue method find the inverse Z transform of

$X(z) = [1 + 3z^{-1}] / [(1 + 3z^{-1} + 2z^{-2})]$, $|z| > 2$. (16)

Or

(b) State and prove the time shifting and convolution property of Z-transform. (16)

18. (a) Evaluate 8-point DFT of the following sequence using DIT-FFT

x[n]={ 2, 1, 2, 1, 1, 2, 1, 2}. (16)

Or

(b) Derive the butterfly diagram of 8 point radix-2 decimation in Time FFT algorithm. (16)

19. (a) Design a digital low-pass Butterworth IIR filter using bilinear z-transform with a 3dB cut-off frequency of 2kHz and minimum attenuation of 30dB at 4.25kHz for a sampling rate of 10kHz. (16)

Or

(b) Design a filter with $H_d(e^{j\omega}) = \begin{cases} e^{-j3\omega}, & \frac{-\pi}{4} \leq |\omega| \leq \frac{\pi}{4} \\ 0, & \frac{\pi}{4} < |\omega| \leq \pi \end{cases}$

Using a Hamming window with N = 7. (16)

20. (a) With a neat block diagram explain in detail about the architecture of TMS320C50. (16)

Or

(b) (i) Draw the block diagram of Harvard architecture of a DSP and explain its blocks. (8)

(ii) Explain various addressing modes of TMS processor. (8)