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

Question Paper Code: 46424

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2019

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. A ramp signal has

   (a) Infinite energy and zero power (b) Infinite energy and infinite power
   (c) zero energy and zero power (d) zero energy and infinite power

2. If a signal f(t) has energy E, the energy of the signal f(2t) is equal to

   (a) E (b) E/2 (c) 2E (d) 4E

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. If all poles of the system function H(z) have magnitude smaller than one, than the system will be

   (a) Stable (b) Unstable (c) BIBO stable (d) Both (a) and (c)

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. Symmetric impulse response having odd number of samples, N=7 with centre of symmetry α is equal to

(a) 2 (b) 5 (c) 3.5 (d) 3

9. The architecture that employs instruction level parallelism is

(a) Von Neumann architecture (b) Harvard architecture
(c) Modified Harvard architecture (d) VLIW architecture

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. What are the differences and similarities between DIF and DIT algorithms?

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) Determine whether the following systems are static or Dynamic, Linear or Nonlinear, Shift variant or Invariant, Causal or Non-causal, Stable or unstable
(i) $y(t) = x(t - 2) + x(2 - t)$
(ii) $y[n] = x[-n]$. (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) Solve $y[k+2] - 5y[k+1] + 6y[k] = 3f[k+1] + 5f[k]$ if the initial conditions are $y[-1] = \frac{11}{6}$, $y[-2] = \frac{37}{36}$, and the input $f[k] = (2)^{-k}u[k]$. (16)

Or

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

18. (a) Derive 8 point radix 2 DIF-FFT algorithm with neat diagram. (16)

Or

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

19. (a) Design a digital Butterworth filter with satisfying the constraints

$0.707 \leq |H(e^{j\omega})| \leq 1$ for $0 \leq \omega \leq \frac{\pi}{2}$

$|H(e^{j\omega})| \leq 0.2$ for $\frac{3\pi}{4} \leq \omega \leq \pi$

With T=1 sec using bilinear transformation. Realize the filter in each case using the most convenient realization form. (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) Explain the architecture of digital signal processors with a neat sketch. (16)

Or

(b) (i) Explain the internal memory organization of TMS320C50 processor (8)

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