**A** **Reg. No. :** | | | | | | | | | | |

# Question Paper Code: 56421

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

Sixth Semester

Electrical and Electronics Engineering

15UEC621 – SIGNAL PROCESSING

(Common to Electronics and Instrumentation Engineering)

(Regulation 2015)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. For a system to be causal CO1- R

   (a) $h(n) \neq 0$ for $n<0$ (b) $h(n)= 0$ for $n<0$ (c) $h(n) = 0$ for $n \geq 0$ (d) $\sum_{k=-\infty}^{\infty} |h(n)|<\infty$

2. Sampling theorem: CO1- R

   (a) fm<fs (b) fs>fm (c) $fs \geq 2fm$ (d) fs=2fm

3. For what kind of signals one sided z-transform is unique? CO2- R

   (a) All signals (b) Anti-causal signal (c) Causal signal (d) None of the above

4. The z transform is a, CO2- R

   (a) finite series (b) infinite power series

   (c) geometric series (d) both a and c

5. The direct evaluation DFT requires -------- complex multiplications CO3- R

   (a) N(N-1) (b) $N^2$ (c) N(N+1) (d) $\frac{N(N-1)}{2}$

6. For a decimation-in-time FFT algorithm, which of the following is true? CO3- R

   (a) Both input and output are in order (b) Both input and output are shuffled

   (c) Input is shuffled and output is in order (d) Input is in order and output is shuffled

7. Which of the following is not suitable either as low pass filter or a High pass filter CO4- R

   (a) h (n) symmetric and 'M' odd (b) h (n) symmetric and 'M' even

   (c) h (n) anti-symmetric and 'M' odd (d) h (n) anti-symmetric and 'M' even

8. In which window sequence, the width of the main-lobe can be adjusted by varying the length N of the window? CO4- R

(a) Hamming (b) Hanning (c) Bartlett (d) Kaiser

9. Size of the ALU of TMS320C54X DSP processor CO5- R

(a) 8-bit (b)16-bit (c) 40-bit (d) 32-bit

10. The addressing mode which makes use of in-direction pointers is CO5- R

(a) Indirect addressing mode (b) 5 Index addressing mode and 7

(c) Relative addressing mode (d) Offset addressing mode

PART – B (5 x 2= 10 Marks)

11. State sampling theorem. CO1- R

12. Determine the discrete time Fourier transform of the sequence CO2- R

x (n) = {1,-1,1,-1}.

13. If DFT [x (n)] = X (k) find DFT [x*(n)]. CO3- R

14. Give the equation for the order N of Chebyshev filter. CO4- R

15. Mention the important feature of Harvard architecture. CO5- R

PART – C (5 x 16= 80 Marks)

16. (a) For each of the following systems, determine whether the system is time variant or time invariant CO1- App (16)

(i) y(n) = x(2n)

(ii) (ii) $y(n) = e^{x(n)}$

(iii) y(n) = x(n) +n x(n+1)

(iv) y(n) = cos [x(n)]

Or

(b) (i) Find whether the signal x(t) = 2 cos (10 t+1) – sin(4t-1) is periodic or not. CO1- App (8)

(ii) Determine the following signals are energy or power signals CO1- App (8)

x(n)=sin(πn/3)

17. (a) (i) State and prove the convolution theorem of Z – transform. CO2- App (8)

(ii) Find the inverse Z – transform of $X(z) = \frac{z^3+z^2}{(z-1)(z-3)}$ CO2- App (8)

ROC:|z| >3.

Or

| | | | | |
|---|---|---|---|---|
| | (b) | (i) Determine the Z transform and ROC of the sequence<br>$x(n) = an \cos((\omega n)u(n)$. | CO2- App | (8) |
| | | (ii) Evaluate the system function of the discrete time system described by the difference equation. $y(n) = 0.5y(n-1)+x(n)$. | CO2- App | (8) |
| 18. | (a) | Compute DFT using DIT-FFT algorithm<br>$X(k) = \{0.5,0.5,0.5,0.5,1,1,-1,-1\}$ | CO3- App | (16) |
| | | Or | | |
| | (b) | Compute 8-point DFT of the following sequence using DIF algorithm.<br>$x(n) = 1$ for $0<n<7$<br>$= 0$ for otherwise | CO3- App | (16) |
| 19. | (a) | Design a second order digital low pass Butterworth filter with a cut-off frequency 3.4 KHz at a sampling rate of 8 KHz using bilinear transformation. | CO4- App | (16) |
| | | Or | | |
| | (b) | Design a digital FIR band pass filter with lower cut off frequency 2000Hz and upper cut off frequency 3200Hz using Hamming window of length N=7.Sampling rate is 10000Hz. | CO4- App | (16) |
| 20. | (a) | Explain various addressing modes of a digital signal processor. | CO5- U | (16) |
| | | Or | | |
| | (b) | Draw the functional diagram of a digital signal processor and explain. | CO5- U | (16) |

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