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

Question Paper Code: 56421

B.E./B.Tech. DEGREE EXAMINATION, MAY 2018

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. The process of conversion of continuous time signal into discrete time signal is known as CO1- R

   (a) aliasing (b) sampling (c) convolution (d) prewarping

2. The system $y(n) = \sin(x(n))$ is, CO1- U

   (a) stable (b) BIBO stable (c) unstable (d) marginally stable

3. The z transform is a, CO2- R

   (a) finite series (b) infinite power series

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

4. The ROC of a system is the CO2- R

   (a) range of z for which the z transform converges
   (b) range of frequency for which the z transform exists
   (c) range of frequency for which the signal gets transmitted
   (d) range in which the signal is free of noise

5. DIT algorithm divides the sequence into CO3- R

(a) Positive and negative values (b) Upper higher and lower spectrum

(c) Even and odd samples (d) Small and large samples

6. In N-point DFT of L-point sequence, the value of N to avoid aliasing in frequency spectrum is, CO3- R

(a) $N \neq L$ (b) $N \leq L$ (c) $N = L$ (d) $N \geq L$

7. 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

8. The zeros of the Butterworth filters exist at CO4- U

(a) left half of s-plane (b)origin (c)infinity (d) right half of s-plane

9. In DSP processors, which among the following maintains the track of addresses of input data as well as the coefficients stored in data and program memories? CO5- U

(a) data Address Generators (DAGs) (b) program sequences

(c) barrel shifter (d) MAC

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

a) Indirect addressing mode b) Index addressing mode

c) Relative addressing mode d) Offset addressing mode

PART – B (5 x 2= 10Marks)

11. What is linear time invariant system? CO1- U

12. State the final value theorem with respect to z transforms. CO2- R

13. Draw the basic butterfly diagram for Radix 2 DIT FFT. CO3- R

14. What is Gibbs phenomenon? CO4- R

15. How is fast computation achieved in DSPs. CO5- U

PART – C (5 x 16= 80Marks)

16. (a) A discrete time system is represented by the following difference equation in which $x(n)$ is input and $y(n)$ is output. CO1-App (16)

$$y(n) = y(n-1) - nx(n) + 2x(n-1) + 3x(n-2)$$

Examine whether the system is linear, shift invariant and causal. In each case, justify your answer.

Or

(b) Identify whether the following signals are energy or power signals. CO1-App (16)

i) $x(n) = \left(\frac{3}{2}\right)^n u(n)$

ii) $x(n) = u(n)$

17. (a) (i) Determine the z transform of the following discrete time signals. CO2- App (8)

$x(n) = \sin(\Omega_o\, nT)$.

(ii) Find the impulse response of the system described by the difference equation CO2- App (8)

$y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$

Or

(b) (i) Find the convolution of two sequences CO2- App (8)

$x(n) = \{-1,1,2,-2\}\ and\ h(n) = \{0.5,1,-1,2,6,4\}$.

(ii) Explain the following properties of DTFT: Periodicity, Time shifting Frequency shifting and conjugation. CO2- App (8)

18. (a) (i) Examine the DFT of the sequence, $x(n) = \{0,1,2,1\}$ using Decimation in Time (DIT) algorithm and Sketch the magnitude and phase spectrum. CO3- App (6)

(ii) Compute the DFT of the sequence $x(n) = (-1)^n$ for the period N=8. CO3- App (10)

Or

(b) Calculate the DFT of a sequence $x(n) = \{1,2,3,4,4,3,2,1\}$ using Decimation in Frequency (DIF) algorithm and Sketch the magnitude and phase spectrum. CO3- App (16)

19. (a) Design and draw the structure of a linear phase FIR high pass filter using hamming window by taking 7 samples with cut off frequency of 0.8π radians/sample. CO4-App (16)

Or

(b) Design a Butterworth digital IIR filter using impulse invariant transformation method by taking T=1 second, for the following specifications. CO4-App (16)

$$0.707 \leq |H\{e^{jw}\}| \leq 1 \qquad 0 \leq w \leq 0.3\pi$$
$$|H\{e^{jw}\}| \leq 0.2 \quad 0.75\pi \leq w \leq \pi$$

Realize the filter using Direct form-II structure.

20. (a) Explain the architecture of digital signal processor with a neat diagram. CO5- U (16)

Or

(b) Describe about the common addressing modes used in digital signal processor. CO5- U (16)