PG/IVS/ELC/402/25

M.Sc. 4th Semester Examination, 2025

ELECTRONICS

(*Digital Signal Processing*)

PAPER – ELC-402

Full Marks : 50

Time : 2 hours

Answer any **four** questions each from Group-A and Group-B and **two** questions from Group-C

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

GROUP—A

Answer any **four** questions : 2×4

1. What do you mean by aliasing effect ?

2. Write down the properties of twiddle factors in Discrete Fourier Transform.

3. What are the different methods of evaluating inverse z-transform ?

4. Define circular convolution.

5. What do you mean by radix-2 algorithm in FFT ?

6. Represent the sequence

$$x(n) = \{4, 2, -1, 1, 2, 3, 5, 1\}$$

as sum of shifted unit impulses.

GROUP–B

Answer any **four** questions : 4×4

7. What do you mean by time-variant and time invariant systems ? $2 + 2$

(*Continued*)

8. Find the z-transform and region of convergence of the following causal sequence : 3 + 1

$$x(n) = \{1, -2, 1, 3, 4\}.$$

9. How will you obtain linear convolution from circular convolution ? 4

10. Find the circular convolution of two finite duration sequences $x_1(n) = \{1, -1, 2, 3\}$ and $x_2(n) = \{0, 1, 2, 3\}$. 4

11. What are the differences and similarities between DIF and DIT algorithms in Fast Fourier transform ? 2 + 2

12. Give comparison between analog filter and digital filter . 4

GROUP – C

Answer any **two** questions : 8×2

13. Find the natural response of the system described by difference equation

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

when the initial conditions are

$y(-1) = y(-2) = 1$. 8

14. Describe the overlap-save method for filtering long duration sequences. 8

15. (*a*) Find the inverse z-transform of

$$X(z) = \frac{1 + 2z^{-1}}{1 - 2z^{-1} + z^{-2}}$$

if $x(n)$ is causal. 4

(*b*) Find the pole-zero plot for the system described by difference equation

$$y(n) = \frac{5}{6}y(n-1) - \frac{1}{6}y(n-2) + x(n) - x(n-1).$$ 4

16. Discuss the digital processing of audio signals and RADAR signals. 4 + 4

[Internal Assessment — 10 Marks]
