

2025

VIRTUAL INSTRUMENTATION*Full Marks: 100***Time: Three hours**

The figures in the margin indicate full marks for the questions.

*Answer **any five** questions.*

1. Draw and explain the operation of the following converters: 10 x 2
= 20
 - (i) Dual slope type ADC and (ii) Weighted resistor type 4-bit DAC.
2.
 - a) What is Virtual Instrumentation? What are the advantages of Virtual Instrumentation? 6
 - b) Draw and explain the Virtual Instrumentation Model and Virtual Instrumentation architecture. 8
 - c) Mention the advantages and disadvantages of LabVIEW. 6
3.
 - a) Write a VI program to convert (i) degree to radian and (ii) Kelvin to Fahrenheit 6
 - b) A first-order response of a system is described by the equation $y(t) = 3.25(1 - e^{-0.025t})$
Write a VI program to obtain the values of $y(t)$ for $t = 8$ minutes and $t = 20$ minutes. 6
 - c) What is Sub-VI? Write a VI program to perform the operation of Gray to binary conversion using Sub-VI. 8
4.
 - a) Explain, with an appropriate example, the operations of WHILE Loop. 7
 - b) Write a VI program to obtain the factorial of n using FOR loop. 6
 - c) Write a VI program to obtain the sum and average for 10 numbers using WHILE loop. 7
5.
 - a) Explain, with the schematic diagram, the operation of Shift Register (SR) and Stack Shift Register (SSR). Give one example for each. Why initializations are needed in SR and SSR? 10
 - b) Write a VI program to obtain the sum of the series $2 + 4 + 6 + 8 + 10 + \dots + n$ terms using SR. 5
 - c) Describe, with the schematic diagram, the operation of Array Subset Function. (ASF). Why it is needed? 5
6.
 - a) Explain, with suitable example, the operations of flat and stacked sequence structures. 7
 - b) Explain, how transpose of a matrix can be obtained in LabVIEW.
Write a VI program to multiplication of two matrices. 6
 - c) Write a VI program to simulate a PID controller. 7
7.
 - a) Explain, with an appropriate example, the operations of Formula nodes. Mention its merits. 8
 - b) Built a VI to compute the following equations using formula nodes: 6
 - (i) $y_1(x) = 4x^3 - 5x^2 + 17$ and (ii) $y_2(x, y) = 2.5x - 9.3y - 6$
 - c) What do you mean by the terms: Cluster – bundle, unbundle, bundle by name and unbundle by name? Give one example for each. 6
8. Write a short note on the following: 4X5=20
 - a) 1st order low pass active filter
 - b) Feedback node and its application
 - c) MyRIO and CRIO
 - d) Determinant of a matrix using VI