Total number of printed pages: **60** **B. Tech. (UG)/8/UIE811**

2023

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) SAR type ADC and (ii) R-2R 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) Fahrenheit to Kelvin 6
   b) A first-order response of a system is described by the equation $y(t) = 1.5(1 - e^{-0.05t})$.
   Create a VI that will solve for the value of *y(t)* for a specified time. Show the value of *y(t)* for t = 2.4 minutes and t = 10 minutes. 6
   c) What is Sub-VI? Give one example where you can reuse Sub VI. 8

4. a) Explain, with an appropriate example, the operations of FOR Loop and WHILE Loop. 7
   b) Write a VI program to obtain the sum of first 15 natural numbers using For loop. 5
   c) Write a VI program to the factorial of n using FOR loop. Assume n = 10. 8

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? 14
   b) Describe, with the schematic diagram, the operation of Array Subset Function. (ASF). Why ASF is used? 6

6. a) Explain the operations of flat and stacked sequence structures. 8
   b) Explain, how determinant and inverse of a matrix can be obtained in LabVIEW. 6
   c) Write a VI program to simulate a PI controller. 6

7. a) Explain, with an appropriate example, the operations of Formula nodes. 6
   b) Built a VI to compute the following equations using formula nodes:
   (i) $y_1(x) = 2x - 5$, (ii) $y_2(x, y) = 1.2x - 5y + 7.5$ and (iii) $y_3(x) = x^3 - 5x^2 + 10$ 9
   c) What do you mean by the terms: Bundle and Bundle by name? Give one example for each. 5

8. Write a short note on the following: 4X5=20
   a) Local and global variables
   b) Multiplexing and de-multiplexing
   c) Sample and hold (S/H) circuit
   d) 2D array using two nested FOR loop