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Question Paper Code	13956
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B.E. / B.Tech. - DEGREE EXAMINATIONS, NOV / DEC 2025

Fifth Semester

Instrumentation and Control Engineering

20ICEL501 - VIRTUAL INSTRUMENTATION

Regulations - 2020

Duration: 3 Hours

Max. Marks: 100

PART - A (MCQ) (10 × 1 = 10 Marks)

Answer ALL Questions

	<i>Marks</i>	<i>K- Level</i>	<i>CO</i>
1. Which of the following best defines Virtual Instrumentation (VI)?	1	K1	CO1
(a) Use of fixed hardware for measurement			
(b) Use of customizable software and modular hardware			
(c) Solely software measurement tools			
(d) Analogue measurement only			
2. The block diagram of a virtual instrument primarily consists of:	1	K1	CO1
(a) Sensors and displays only			
(b) Terminals, nodes, and wires			
(c) Only processing modules			
(d) Controls and Indicators			
3. Local variables in LabVIEW are used to:	1	K1	CO2
(a) Store data between SubVIs			
(b) Share data within one VI			
(c) Store data across program runs			
(d) Create user interfaces			
4. A cluster in LabVIEW can contain:	1	K1	CO2
(a) Only numeric data types			
(b) Only Boolean values			
(c) Mixed data types			
(d) Only string data types			
5. The driver software used for programming NI-DAQ devices is called:	1	K1	CO3
(a) NI-MAX			
(b) NI-DAQmx			
(c) NI-LabVIEW			
(d) NI-DAQ classic			
6. NI Measurement and Automation Explorer (NI MAX) is mainly used for:	1	K1	CO3
(a) Configuring and testing NI hardware and devices			
(b) Writing LabVIEW code			
(c) Designing GUIs			
(d) Editing DAQmx driver source code			
7. The primary function of windowing in LabVIEW signal processing is to	1	K1	CO4
(a) Reduce spectral leakage in FFT			
(b) Increase signal amplitude			
(c) Filter out DC component			
(d) Amplify noise			
8. NI LabVIEW IMAQ Vision tools are used primarily for:	1	K1	CO4
(a) Audio processing			
(b) Image acquisition and processing			
(c) Signal filtering			
(d) Video Processing			
9. The data type of the input terminal of a multi-plot waveform chart is usually	1	K1	CO5
(a) Boolean			
(b) Cluster of Waveforms or 2-D Array of Numerics			
(c) String			
(d) Enum			
10. Choose the USB based DAQ devices - products of national Instruments having plug and play compatibility operations with Laptops and desktops	1	K1	CO5
(a) NI-6211			
(b) NI- 9174			
(c) NI-6001			
(d) NI-9188			

PART - B (12 × 2 = 24 Marks)

Answer ALL Questions

11. Differentiate Traditional and Virtual Instruments.	2	K2	CO1
12. Summarize the Common Interface Buses Used in Virtual instrumentation.	2	K2	CO1
13. Infer the concept of Polymorphism in LabVIEW.	2	K2	CO2
14. Outline the use of case and Sequence Structures in LabVIEW Programming.	2	K2	CO2

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|---|---|----|-----|
| 15. State the purpose of Instrument I/O Assistant in LabVIEW. | 2 | K1 | CO3 |
| 16. Classify the signal sources in an Analog input acquisition System. | 2 | K2 | CO3 |
| 17. Enumerate the Purpose of Intensity Charts used as Signal output display in LabVIEW. | 2 | K2 | CO4 |
| 18. Illustrate the use of NI-IMAQ in Industrial machine Vision applications. | 2 | K2 | CO4 |
| 19. Differentiate Property node and formula node in LabVIEW. | 2 | K2 | CO5 |
| 20. In modular Programming using LabVIEW show how auto indexing is used in arrays inside a loop. | 2 | K1 | CO5 |
| 21. Infer the Use of Tunnels in Case Structures. | 2 | K2 | CO2 |
| 22. Relate Error in and Error Out operations in clusters used for Error handling Operations in LabVIEW. | 2 | K1 | CO2 |

PART - C (6 × 11 = 66 Marks)

Answer ALL Questions

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|---|----|----|-----|
| 23. a) Explain with necessary block diagram architecture of Virtual Instrumentation. | 11 | K2 | CO1 |
| OR | | | |
| b) (i) Compare GPIB, Ethernet and USB interface Buses used for data acquisition in LabVIEW. | 6 | K2 | CO1 |
| (ii) Compare Text based Programming languages with Graphical Programming. | 5 | K2 | CO1 |
| 24. a) (i) Build a VI program using LabVIEW for converting Celsius to Fahrenheit temperature. | 6 | K3 | CO2 |
| (ii) Develop a VI program in LabVIEW for $Y = (A*B*C)+(D*E)$ using Logical operators. | 5 | K3 | CO2 |
| OR | | | |
| b) (i) Build a VI program using LabVIEW to find the sum of the first 10 natural numbers using For Loops. | 6 | K3 | CO2 |
| (ii) Build a VI Program using LabVIEW to execute a while loop that reads integer values from the user and calculates their sum. The program should continue to read and add values until the user enters the value 0, at which point the loop should terminate and the total sum should be displayed. | 5 | K3 | CO2 |
| 25. a) Explain in detail with an example DAQ Assistant as driver software used with LabVIEW application software. | 11 | K2 | CO3 |
| OR | | | |
| b) (i) Explain the basic steps in the installation of DAQ cards in a PCI device. | 6 | K2 | CO3 |
| (ii) Explain briefly VISA as a single library of functions used in LabVIEW. | 5 | K2 | CO3 |
| 26. a) Apply Signal Processing Tools in LabVIEW and demonstrate -Noise reduction in Biomedical ECG Signal. Perform frequency analysis using FFT tool. | 11 | K3 | CO4 |
| OR | | | |
| b) Develop a LabVIEW Virtual Instrument (VI) that performs various preprocessing operations on a digital image using Vision and Image Processing (VISA / IMAQ) functions. Analyze how each preprocessing enhances the image quality. | 11 | K3 | CO4 |
| 27. a) A single-tank open liquid system (sensor measures liquid level; a pump/valve actuates inflow; there is an outlet causing leakage/outflow) is given as an experimental setup. Perform the mathematical modeling to derive the plant transfer function Using LabVIEW, build a Virtual Instrument (VI) that implements a closed-loop PID liquid-level control system. | 11 | K3 | CO5 |

OR

b) A chemical process requires maintaining the temperature of a liquid within a specific range (40 °C – 60 °C). Design a modular LabVIEW application that reads temperature sensor data, converts it, and performs control logic. To improve scalability and code reuse, design must employ Sub-VIs. 11 K3 CO5

28. a) Simplify and analyze Kirchhoff's Voltage law using arrays in LabVIEW for the given matrix. (Write the KVL equations and apply Cramer's rule). 11 K4 CO5

$$\begin{bmatrix} 10 & 2 & 1 \\ 2 & 8 & -2 \\ 1 & -2 & 5 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I_3 \end{bmatrix} = \begin{bmatrix} 12 \\ 8 \\ 4 \end{bmatrix}$$

OR

b) Analyze the use of Case Structures in LabVIEW to solve quadratic equations. (Fix equations covering all types of Roots of the equation) Display roots in waveform chart. 11 K4 CO5