Reg. No. :

Question Paper Code: U5B03

B.E./B.Tech. DEGREE EXAMINATION, APRIL 2024

Fifth Semester

Biomedical Engineering

21UBM503-VIRTUAL BIO INSTRUMENTATION

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer All Questions

PART A - (10 x 2 = 20 Marks)

1. State the role of the graphical user interface (GUI) in Virtual Instruments?   CO1-U

2. Define a Virtual Instrument (VI), and why is it needed in the field of   CO1-U
    measurement and testing?

3. Define debugging in LabVIEW.   CO1-U

4. Design a simple block diagram for a Virtual Instrument to perform   CO2-App
    temperature monitoring.

5. Give the primary advantage of using a state machine design pattern in   CO1-U
    LabVIEW applications.

6. Demonstrate the concept of auto-indexing in LabVIEW arrays.   CO1-U

7. Describe the steps involved in initializing a DAQ assistant in LabVIEW.   CO1-U

8. Define the term "Data Acquisition" and briefly explain its significance in   CO1-U
    the field of measurement and control.

9. Sketch the block diagram of DAQ in LabVIEW.   CO1-U

10. Analyze the signals that will be acquired in a VI in a patient monitoring   CO3-Ana
    system.

PART – B (5 x 16= 80 Marks)

11. (a) Analyze the different components of a virtual instrument block   CO1-U   (16)
         diagram, explain their functions and also compare it with
         traditional instruments.

Or

(b) Compare and contrast the advantages and disadvantages of using virtual instruments. CO1-U (16)

12. (a) Explain the purpose and functionality of the Front Panel and Block Diagram in LabVIEW. Describe its components and palettes used in them. Describe how a VI is generated and RUN in LabVIEW. CO1-U (16)

Or

(b) Discuss the role of the icon and connector panels in LabVIEW programming, and explain how they facilitate data transfer between VIs.Explain the concept of data types in LabVIEW programming, and provide examples of different data types and their uses. CO1-U (16)

13. (a) Evaluate the importance of error handling in LabVIEW applications and discuss how error clusters enhance robustness and reliability. Develop a LabVIEW VI that includes error clusters to handle various potential errors in a data acquisition system. Explain how your error handling strategy contributes to the overall reliability of the system. CO3-Ana (16)

Or

(b) Analyze the differences between case structures and the formula node in LabVIEW. Discuss scenarios where each element is more suitable for implementing specific logic or calculations. Develop a LabVIEW VI that incorporates both case structures and the formula node to solve a complex medical problem. CO3-Ana (16)

14. (a) Explain the concept of a Task in NI-DAQmx and its significance in LabVIEW. Discuss the steps involved in creating and configuring a Task in LabVIEW for data acquisition. Provide an example illustrating the use of Task in a LabVIEW program. CO1-U (16)

Or

(b) Describe the concepts involved in DAQ hardware and DAQ software. Describe how they are involved in acquiring real time data from the sensors. Give examples related to Biomedical Engineering. CO1-U (16)

15. (a) Design a LabVIEW VI for real-time temperature monitoring CO3-Ana (16)
    using a thermocouple sensor and DAQ Assistant. Discuss the
    selection of hardware components, sensor calibration, and the
    implementation of error handling in your VI. Explain how your
    VI ensures accurate temperature measurements.

<div align="center">Or</div>

(b) Discuss the principles of human-machine interaction and user CO3-Ana (16)
    interface design for assistive device control VIs. Explain how
    LabVIEW can be used to create user-friendly interfaces for
    individuals with disabilities. Provide an example VI with an
    accessible user interface.

U5B03

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