Seat No.		**Set**	**P**

M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Hardware, Programming and IDE tools - AVR and PIC Series (2315101)

Day & Date: Wednesday, 29-10-2025   Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
         2) Draw neat diagrams and write equations wherever necessary.
         3) Figures to the right indicate full marks.
         4) Use of log-tables and calculator is allowed.
         5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ)   **08**

1) The number of general purpose working registers in ATmega32 series are _____.
   a) 8   b) 16
   c) 24   d) 32

2) The IDE tool used for programming AVR microcontroller is _____.
   a) Microchip Studio   b) ATMEL Studio
   c) both a & b   d) MPLAB

3) The flash program memory data bus in PIC16C5x series μ-controller is _____ wide.
   a) 8-bit   b) 10-bit
   c) 12-bit   d) 16-bit

4) The IDE tool used for PIC μ-controller series is _____.
   a) MPLAB   b) Microchip Studio
   c) ATMEL Studio   d) Keil μ -Vision

5) The ATmega32 AVR includes _____ multichannel ADC.
   a) 10 bit   b) 12 bit
   c) 8 bit   d) 16 bit

6) The C language instruction "$DDRB = DDRB$ & $\sim(1 << 5)$;" will _____.
   a) Configure PORT-B as an output port
   b) Configure PORT-B as input port
   c) Configure PB-5 pin of PORT-B as o/p
   d) Configure PB-5 pin of PORT-B as i/p

7) The number of general purpose registers in Bank-0 of PIC16C5x series microcontroller is _____.
   a) 8
   b) 16
   c) 24
   d) 32

8) The total number of interrupts in ATmega328 as per the interrupt vector table are _____.
   a) 08
   b) 12
   c) 15
   d) 26

B) Fill in the blanks or Write True/False. 04
   1) ATMEGA328 has 2 KBytes of internal SRAM. (True/False)
   2) The 16-bit X register in ATmega32 series consists of two 8-bit general purpose registers _____ & _____ merged together.
   3) ATmega328 microcontroller Watch Dog Timer has a separate on-chip oscillator of _____ KHz.
   4) The 8-bit Timer/Counter register used in PIC16C5x series microcontroller is named as OPTION register. (True/False).

Q.2 Answer the following. (Any Six) 12
   a) Draw the bit-wise structure of AVR series Status register.
   b) Write a C language instruction to configure PORT-B as an input port for ATmega32.
   c) Draw the external brown-out protection circuit for PIC16C5x series.
   d) Draw the bit assignment for OPTION register in PIC16C5x series.
   e) Enlist the family members of PIC family.
   f) List any four features of ATMEL/Microchip Studio.
   g) Explain the role of INDF register in PIC16C5x series microcontroller.
   h) Write the C instructions to logically AND the values 25H and 81H for PIC series.

Q.3 Answer the following. (Any Three) 12
   a) Draw the simplified view of AVR ATmega32 series microcontroller.
   b) Write a note on Power-on-Reset (POR) in PIC16C5x series.
   c) Write a C program for AVR ATmega32 series to read the data from PORT-B and PORT-C, add the data and send the result to PORT-D.
   d) Draw the equivalent circuit for a single I/O port pin of PIC16C5x series and explain.

Q.4 Answer the following. (Any Two) 12
   a) Explain the 28-pin distribution of ATmega328 microcontroller.
   b) Write a note on IDE tool ATMEL or Microchip Studio for AVR ATmega 32 series.
   c) Write a note on IDE tools MPLAB for PIC series of microcontroller.

Q.5 Answer the following. (Any Two) 12

a) Write a C program to blink alternate LEDs connected to Port-B using delay library function for PIC16C5x series microcontroller.

b) Assuming a crystal frequency of 8 MHz, write a C program to generate a square-wave of frequency 1 KHz on port pin PB-2 without pre-scalar option for ATmega32 series.

c) Assuming a crystal frequency of 20 MHz, write a C program to serially send the ASCII data string "Together We Unite" to PC at a standard baud rate of 9600 for PIC16C5x series.

Seat No.

M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Sensors and Actuators (2315102)

Day & Date: Friday, 31-10-2025   Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and write equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log-tables and calculator is allowed.
5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ)   **08**

1) Which characteristic describes the smallest input a sensor can detect?
   a) Linearity   b) Dead band
   c) Resolution   d) Accuracy

2) Which of the following is a primary characteristic of a sensor?
   a) Backlash   b) Dead band
   c) Linearity   d) Sensitivity

3) A sensor with high _____ can detect smaller changes in input.
   a) Linearity   b) Sensitivity
   c) Repeatability   d) Dead band

4) Sensitivity in a sensor measures: _____.
   a) The smallest detectable change
   b) The overall accuracy
   c) The device's impedance
   d) The range of detection

5) Which type of proximity sensor can be used as touch sensor?
   a) Inductive proximity sensor
   b) Capacitive proximity sensor
   c) Ultrasonic proximity sensor
   d) Photoelectric proximity sensor

6) Which of the following is a type of rotary actuator?
   a) Solenoid   b) Stepper motor
   c) Linear potentiometer d) Resistance thermometer

7) Barometer is which type of sensor?
   a) Pressure sensor   b) Touch sensor
   c) Temperature sensor d) Humidity sensor

8) Which materials are made from chemical raw materials called monomers?
    a) Silicon   b) Glass
    c) Plastics   d) All the above

B) Fill in the blanks OR Write True/False.   **04**
1) _____ is the most abundant and easily available sensing material.
2) The primary function of a _____ is to detect strain.
3) Thermistors have a high _____ coefficient.
4) Dead band in sensors is the range within which there is no response to input. (True/False)

Q.2 Answer the following. (Any Six)   **12**
  a) Define repeatability in sensors.
  b) List any two characteristics of a strain gauge.
  c) Explain the concept of response time.
  d) What is the purpose of a capacitor microphone?
  e) Describe the construction of a stepper motor.
  f) State two applications of LVDT.
  g) Define the term "dead band" in sensor operation.
  h) Explain the use of a resistance thermometer.

Q.3 Answer the following. (Any Three)   **12**
  a) Describe the principle of operation of a hot-wire anemometer.
  b) Discuss the construction and application of a thermistor.
  c) Explain how biosensors are used in chemical sensing.
  d) What are the key features of piezoelectric actuators?

Q.4 Answer the following. (Any Two)   **12**
  a) Draw the schematic design of a micro biosensor and explain. Draw the sensor response curve and explain.
  b) Explain the characteristics and applications of an induction potentiometer.
  c) Discuss the role of silicon in the fabrication of photodiode for light sensing. Explain how the silicon nature enables efficient conversion of light into electrical signal providing silicon based photodetector.

Q.5 Answer the following. (Any Two)   **12**
  a) Explain the types of microactuators and give one example for each.
  b) Explain the principle of operation and uses of a stepper motor.
  c) Discuss Sensor materials Ceramics and Glasses.

Seat No.		Set	P

M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)
Examination: October/November – 2025
Programming with C and C++ (2315107)

Day & Date: Monday, 03-11-2025   Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
         2) Draw neat diagrams and write equations wherever necessary.
         3) Figures to the right indicate full marks.
         4) Use of log-tables and calculator is allowed.
         5) Use of Mobile is strictly prohibited.

Q.1 A) Multiple Choice Question.   08

1) Which of the following is not a storage class specifier in C++?
   a) Static   b) Dynamic
   c) Auto   d) Register

2) Which header file must be included to use the 'printf' and 'scanf' functions in C?
   a) stdlib.h   b) math.h
   c) stdio.h   d) string.h

3) Which escape sequence is used to represent a new line in C?
   a) \n   b) \t
   c) \r   d) \a

4) Which bitwise operator is used to set a particular bit to 1 in C?
   a) &   b) |
   c) ∧   d) ~

5) Which keyword is used to define a class in C++?
   a) Class   b) Type
   c) Struct   d) Define

6) Which C++ features is used to achieve function overloading?
   a) Overwrite   b) Overload
   c) Over function   d) None of the above

7) What is the purpose of the 'static' keyword in a C++ class?
   a) Declares a static variable
   b) Allocates dynamic memory
   c) Defines a constant
   d) Specifies a static member of a class

8) What is the correct syntax for declaring an integer variable in C.
   a) int x;
   b) integer x;
   c) x = int;
   d) declare x as int;

B) State True or False. **04**
   1) iostream. H header file is required for input and output operations in C++
   2) Allocate operator is used for dynamic memory allocation in C.
   3) The 'scan' function Reads formatted input in C.
   4) * Operator is used to access the value stored in a pointer variable in C.

Q.2 Answer the following. (Any Six) **12**
   a) Explain the role of the main() function in a C program.
   b) What is the difference between printf() and scanf() functions in C?
   c) How can you pass parameters to a function in C?
   d) What is the purpose of the break statement in a C program?
   e) Describe the purpose of the virtual keyword in C++.
   f) What is polymorphism in C++? Provide an example.
   g) Explain the purpose of the const keyword in C++.
   h) Describe the use of the friend keyword in C++.

Q.3 Answer the following. (Any Three) **12**
   a) Explain the concept of arrays in C. Provide examples illustrating array declaration, initialization, and accessing array elements.
   b) Discuss the role of pointers in C++ and illustrate with an example demonstrating pointer Arithmetic.
   c) Define the term "token" in C++. Provide examples of different types of tokens.
   d) Explain the role of member functions in C++ classes. Provide examples demonstrating the use of member functions.

Q.4 Answer the following. (Any Two) **12**
   a) Describe the process of dynamic memory allocation in C using 'malloc' and 'free'. Provide examples to demonstrate how to allocate and deallocate memory dynamically.
   b) Illustrate the use of templates in C++. Explain how template functions and classes work, providing examples for both.
   c) Describe the concept of multiple inheritance in C++. Provide examples demonstrating its implementation and potential challenges.

Q.5 Answer the following. (Any Two)   **12**

a) Explain the purpose and implementation of file handling in C. Provide examples demonstrating how to read from and write to files, both in text and binary modes.

b) Compare and contrast arrays and linked lists in C. Explain the advantages and disadvantages of each data structure, providing examples to support your discussion.

c) Discuss the importance of the 'const' keyword in C. Provide examples demonstrating its use in variable declarations, function parameters, and pointers

Seat No.		Set	P

M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Research Methodology (2315103)

Day & Date: Thursday, 06-11-2025   Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and write equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log-tables and calculator is allowed.
5) Use of Mobile is strictly prohibited.

Q.1 A) Multiple Choice Question.   08

1) Which type of validity is concerned with whether a test measures what it claims to measure?
   a) Construct validity   b) Reliability
   c) External validity   d) Statistical validity

2) Which of the following is a measure of central tendency?
   a) Standard deviation   b) Mean
   c) Variance   d) Range

3) What is the primary goal of descri3ptive research?
   a) To test hypotheses
   b) To describe characteristics of a phenomenon
   c) To establish causality
   d) To conduct experiments

4) In a histogram, what does the height of each bar represent?
   a) The category of the data   b) The range of the data
   c) The frequency of the data   d) The variance of the data

5) What is triangulation in research?
   a) Using three participants in a study
   b) Applying multiple methods or data sources to validate findings
   c) Conducting three separate studies on the same topic
   d) Testing a hypothesis three times

6) What type of variable is gender in research?
   a) Continuous   b) Dependent
   c) Quantitative   d) Categorical

7) What does the term "operationalization" refer to in research?
   a) Developing a theory
   b) Defining variables in measurable terms
   c) Conducting a literature review
   d) Writing the research report

8) Which research method is best suited for studying rare phenomena?
   a) Case study
   b) Survey
   c) Experiment
   d) Content analysis

B) State True or False. 04
   1) An independent variable is manipulated to observe its effect on a dependent variable in experimental research.
   2) Primary data refers to information that is collected firsthand for a specific research purpose.
   3) Informed consent is an optional aspect of ethical research practices.
   4) Reliability in research refers to the consistency of a measure or instrument.

Q.2 Answer the following. (Any Six) 12
   a) Why is it essential to establish the reliability of a measurement instrument?
   b) What is the role of a control group in experimental research?
   c) Explain the concept of external validity in research.
   d) What is the difference between descriptive and inferential statistics?
   e) Why is random sampling important in research?
   f) Define "thematic analysis" in qualitative research.
   g) What is the purpose of conducting a pilot study?

Q.3 Answer the following. (Any Three) 12
   a) What is the importance of literature review in the research process?
   b) Explain the significance of sampling in research. Discuss different sampling techniques and when each is appropriate.
   c) Discuss the role of hypothesis testing in quantitative research.
   d) Describe the concept of reliability in research. Why is it important?

Q.4 Answer the following. (Any Two) 12
   a) Discuss the strengths and weaknesses of using closed-ended questions in a research instrument.
   b) Describe how a researcher would determine the appropriate scale of measurement for a variable.
   c) Discuss the importance of reliability in the context of research instruments.

Q.5 Answer the following. (Any Two)   **12**
    a) What are the ethical considerations researchers must keep in mind when using closed-ended questions in surveys?
    b) Explain the significance of the p-value in hypothesis testing.
    c) Discuss the role of control variables in quantitative research.

| Seat No. | | Set | P |

M.Sc. Electronics (IOT) (Semester - II) (New) (NEP CBCS) Examination: October/November - 2025
Interfacing and Embedded System Design using – AVR and PIC Microcontrollers (2315201)

Day & Date: Tuesday, 28-10-2025　　　　　　　　　　　　Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
　　　　　　　　2) Draw neat diagrams and write equations wherever necessary.
　　　　　　　　3) Figures to the right indicate full marks.
　　　　　　　　4) Use of log-tables and calculator is allowed.
　　　　　　　　5) Use of Mobile is strictly prohibited.

Q.1　A)　Choose correct alternative. (MCQ)　　　　　　　　　　　08

1) What is the purpose of an RTC like DS1307 in embedded systems?
　　a) To measure temperature
　　b) To synchronize time-sensitive operations
　　c) To control servo motors
　　d) To generate PWM signals

2) Which of the following is a typical method for interfacing a keyboard with a microcontroller?
　　a) Serial communication　　　b) Parallel communication
　　c) USB communication　　　　d) SPI communication

3) What is the primary purpose of a microcontroller in an embedded system?
　　a) To provide high processing power
　　b) To interface with external devices and perform control functions
　　c) To facilitate communication between different embedded systems
　　d) To provide graphical user interface (GUI) capabilities

4) What does ADC stand for in the context of microcontroller peripherals?
　　a) Analog Digital Converter
　　b) Analog Data Communication
　　c) Advanced Digital Control
　　d) Automated Data Conversion

5) Which type of relay uses a small amount of current to control a larger current and is suitable for use in embedded systems?
   a) Electromechanical relay   b) Solid-state relay
   c) Solenoid   d) Optoisolator

6) What is the purpose of the #define directive in Embedded C?
   a) To declare a constant
   b) To include a header file
   c) To define a function
   d) To declare a structure

7) An embedded system is _____.
   a) A system that can only perform predefined tasks
   b) A system that consists of hardware and software designed for specific functions within a larger system
   c) A system that can be easily modified to perform different tasks
   d) A system that is not capable of running software

8) Which of the following is true about PWM (Pulse Width Modulation) control of DC motors using an H-bridge?
   a) It allows for precise control of motor speed
   b) It is suitable only for on-off control
   c) It is primarily used for stepper motors
   d) It does not require an H-bridge configuration

B) Write True or False.   **04**
   a) AVR microcontrollers are manufactured by Atmel, which is now a subsidiary of Microchip Technology.
   b) PIC microcontrollers often have a not wide range of operating voltages, making them versatile for different applications.
   c) AVR microcontrollers are based on Harvard architecture.
   d) Both AVR and PIC microcontrollers typically use RISC architecture.

Q.2 Answer the following. (Any Six)   **12**
   a) What is the difference between RAM and ROM in an embedded system?
   b) What is meant by "bit manipulation" in embedded C programming?
   c) What is the purpose of a crystal oscillator in embedded systems?
   d) What is the concept of PWM (Pulse Width Modulation) in embedded systems?
   e) What is the role of the main() function in an embedded C program?
   f) What is the purpose of the volatile keyword in embedded C programming?
   g) Describe the significance of the #include directive in embedded C programming?
   h) Define signal conditioning in the context of sensor interfacing

Q.3 **Answer the following. (Any Three)** **12**
   a) Describe the importance of real-time clock (RTC) modules in AVR ATmega / PIC microcontroller-based systems. What are the typical applications of RTCs?
   b) Explain the principle of operation of a solenoid and its applications in AVR ATmega / PIC microcontroller-based systems. How does the microcontroller control the solenoid actuation?
   c) Discuss the hardware connections required for interfacing a stepper motor driver with an AVR ATmega / PIC microcontroller. How do you control the motor's step sequence and speed?
   d) Discuss the hardware connections required for interfacing a 7-segment display with an AVR ATmega / PIC microcontroller. How do you control individual segments?

Q.4 **Answer the following. (Any Two)** **12**
   a) Describe the steps involved in interfacing an analog sensor with an AVR ATmega / PIC microcontroller using the built-in ADC. Include hardware connections and software configuration.
   b) Describe the hardware connections required for interfacing a solid-state relay with an AVR ATmega / PIC microcontroller. How do you control the relay switching?
   c) Describe the hardware connections required for interfacing an electromechanical relay with an AVR ATmega / PIC microcontroller. How do you control the relay coil?

Q.5 **Answer the following. (Any Two)** **12**
   a) Explain the principle of operation of an H-bridge circuit in PWM control of a DC motor with an AVR ATmega / PIC microcontroller. How does it control motor direction in an elevator system?
   b) Discuss the techniques used for displaying text and numbers on an LCD module using an AVR ATmega / PIC microcontroller. How do you handle scrolling and line wrapping in an advertising display?
   c) Describe the steps involved in interfacing a temperature sensor (e.g., LM35) with an AVR ATmega / PIC microcontroller. How do you control temperature in a greenhouse system?

Seat No.	

M.Sc. Electronics (IOT) (Semester - II) (New) (NEP CBCS)
Examination: October/November - 2025
Fundamentals of Internet of Things (2315202)

Day & Date: Thursday, 30-10-2025 　　　　　　　　Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
　　　　　　　 2) Draw neat diagrams and write equations wherever necessary.
　　　　　　　 3) Figures to the right indicate full marks.
　　　　　　　 4) Use of log-tables and calculator is allowed.
　　　　　　　 5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ) 　　　　　　　　　　08

1) Solenoid valve is an example of _____.
   a) Sensor　　　　　　　　　b) Processing unit
   c) Actuator　　　　　　　　d) Display unit

2) XMPP uses _____ architecture.
   a) Publish-Subscriber　　　b) Client-Server
   c) Request-Response　　　 d) All of these

3) Which component of OpenStack will you use to access all other components?
   a) Horizon　　　　　　　　 b) Glance
   c) Neutron　　　　　　　　 d) Heat

4) Which of the following issues need to be addressed while solving user interoperability?
   a) device characterization and identification
   b) syntactic interoperability
   c) semantic interoperability
   d) all of these

5) Suppose that an Arduino Uno board is connected to a digital module PIR sensor which sends the 0 or 1, which function will you use to read the sensor data?
   a) digitalRead()　　　　　　b) digitalWrite()
   c) analogRead()　　　　　　d) analogWrite()

6) Which among the following is NOT a component of OpenStack?
   a) Horizon　　　　　　　　 b) Heat
   c) Neutron　　　　　　　　 c) Plasma

7) When two IoT devices wish to communicate, semantic conflict in such a scenario in IoT interoperability refers to _____.
   a) Two devices having different processing and business logic
   b) Two devices sensing the same physical parameters
   c) Two devices having different locations
   d) Two devices built by same manufacturer

8) Which among the following is implemented along-with sensor cloud to make its services and performance better?
   a) cashing   b) caching
   c) casing   d) calling

B) Fill in the blanks or Write True/False.   **04**
   a) Statement: Badly failed nodes are simply those that are unable to perform an operation which could be because of power failure and environmental events. (True or False)
   b) Full form of NFC is _____.
   c) Statement: Low-End sensor nodes perform basic functions such as data aggregation, autoconfiguration, power saving as well as they increase network life-time. (True or False)
   d) Statement: Sensor cloud is simply dumping and organizing of sensor data on cloud computing platform. (True or False)

Q.2 Answer the following. (Any Six)   **12**
   a) What do you mean by the term Address Crunch in IoT?
   b) Give the working principle of RFID?
   c) Write the full-forms of [CoAP and XMPP] or [AMQP and MQTT].
   d) List the components of IoT.
   e) What are Piconets?
   f) What are the components of Software Defined Network?
   g) Enlist the Control and Loop statements supported by Arduino IDE.
   h) List any four Cloud Simulators.

Q.3 Answer the following. (Any Three)   **12**
   a) Write a short note on IoT Gateways.
   b) Explain IoT service oriented architecture.
   c) Draw the Protocol Stack diagram for Bluetooth.
   d) Draw the basic architecture of Raspberry Pi and discuss its specifications.

Q.4 Answer the following. (Any Two)   **12**
   a) Explain Zigbee Topologies, features and applications.
   b) With the help of Layered diagram, explain different service model - SaaS, PaaS and IaaS.
   c) Explain with neat diagram, the Smart Grid Communication.

Q.5 Answer the following. (Any Two)   **12**

    a) What are the components of IoT Health-care System? How Remote Health-care, Real-time Monitoring and Preventive-care is accomplished?

    b) Explain device interoperability concerned to UMB-core and UMB-adaptor.

    c) Explain the feature, frame types and applications of AMQP.

<table>
<tr><td>Seat No.</td><td></td></tr>
</table>

Set **P**

M.Sc. Electronics (IOT) (Semester - II) (New) (NEP CBCS) Examination: October/November – 2025
Application Development using Arduino, NodeMCU and LORA (2315207)

Day & Date: Saturday, 01-11-2025   Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) All questions are compulsory.
         2) Draw neat diagrams and write equations wherever necessary.
         3) Figures to the right indicate full marks.
         4) Use of log-tables and calculator is allowed.
         5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative.   **08**

1) What is the purpose of the setup() function in Arduino?
    a) To declare variables
    b) To define the main program loop
    c) To initialize hardware and other settings
    d) To perform mathematical calculations

2) Which of the following is NOT a commonly used Arduino board?
    a) Arduino Uno   b) Arduino Nano
    c) Arduino Python   d) Arduino Mega

3) Which function is used to set the mode of a pin as input or output in Arduino?
    a) pinMode()   b) digitalRead()
    c) digitalWrite()   d) analogRead()

4) What is the NodeMCU development board primarily based on?
    a) ATmega microcontroller   b) ESP8266/32 chipset
    c) Raspberry Pi   d) PIC microcontroller

5) What is the main feature of NodeMCU?
    a) Built-in Bluetooth   b) Wi-Fi connectivity
    c) High processing speed   d) Long-range communication

6) What does LoRa stand for in LORA RF Module?
    a) Low Radiation   b) Low Resistance
    c) Local Radio   d) Long Range

7) What is the purpose of PWM in controlling the speed of a DC motor?
    a) To generate a digital signal
    b) To regulate the power supplied to the motor
    c) To convert digital signals to analog signals
    d) To control the direction of rotation

8) What is the purpose of the AnalogWrite function in Arduino?
   a) To read analog input
   b) To write analog output
   c) To set the mode of a pin
   d) To initialize serial communication

B) Fill in the blanks Or True/False. 04
1) Arduino Uno is the smallest Arduino board available. (True/False)
2) The library providing advanced mathematical functions in Arduino is ____.
3) The main purpose of a LoRa RF module is to enable ____ communication over long distances.
4) NodeMCU provides GPS module for location tracking. (True/False)

Q.2 Answer the following. (Any Six) 12
a) Describe the structure of an Arduino program.
b) Explain the program structure in Arduino, including data types, variables, constants, and operators.
c) What are functions in Arduino? Explain how to define and use functions in Arduino programming.
d) Explain the concept of loops and functions in Arduino programming?
e) What are strings and strings objects in Arduino? How are they used in programming?
f) Which function is commonly used to interface with the SX1278 LoRa module in Arduino?
g) Discuss the concept of Pulse Width Modulation (PWM) and its application in Arduino.
h) What is the main purpose of LoRa RF module?

Q.3 Answer the following. (Any Three) 12
a) Explain the concept of I/O pin mode in Arduino and how it affects digital input/output operations.
b) Explain the significance of the ESP8266/32 development board in the context of IoT (Internet of Things) Applications.
c) Discuss Arduino I/O function libraries. Explain digital read/write.
d) Explain Master Transmitter Slave Receiver, Master Receiver Slave Transmitter.

Q.4 Answer the following. (Any Two) 12
a) Discuss Basic Overview of Arduino.
b) Discuss the pin description and features of LORA RF Module.
c) Interfacing of NODE MCU modules ESP8266 development board to Arduino-UNO. Use two modules and two Arduino - UNO boards to establish a wireless common link. Use Arduino IDEs to write the program to display received data on serial monitor.

Q.5 **Answer the following. (Any Two)** **12**

    a) Ultrasonic Receiver/ transmitter Interfacing to Arduino - UNO. Use Arduino IDE to write the program to find the distance between the two objects in centimeters.

    b) What are variables and constants in Arduino? Differentiate between them with examples.

    c) Interface the Temperature sensor with Arduino UNO. Control the temperature of Room between 28°C to 35°C.

Seat No.		Set	P

M.Sc. Electronics (IOT) (Semester - III) (New) (NEP CBCS)
Examination: October/November - 2025
Introduction to Raspberry Pi (2315301)

Day & Date: Wednesday, 29-10-2025   Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and write equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log-tables and calculator is allowed.
5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ)   08

1) The Raspberry Pi is based on _____ type of architecture.
   a) ARM   b) x86
   c) RISC-V   d) MIPS

2) _____ SoC is used in Raspberry pi 4.
   a) Broadcom BCM2837
   b) Broadcom BCM2711
   c) Qualcomm Snapdragon
   d) Intel Atom

3) The SD card in Raspberry Pi is primarily used for _____.
   a) Data backup
   b) Network configuration
   c) Booting the operating system
   d) Display output

4) _____ command-line interface is commonly used in Raspberry Pi.
   a) CMD   b) Bash
   c) Power Shell   d) Python shell

5) The GPIO pins of Raspberry Pi can be controlled using _____.
   a) RPi.GPIO library   b) NumPy
   c) OpenCV   d) Pandas

6) PWM in Raspberry Pi is mainly used for _____.
   a) Reading sensors   b) Motor control
   c) Display interfacing   d) File handling

7) _____ Python library is used for GUI-based GPIO access.
   a) Tkinter   b) Pyserial
   c) Matplotlib   d) Pygame

8) _____ of the following can be interfaced with Raspberry Pi.
   a) Relay   b) LCD
   c) PIR sensor   d) All of the above

B) Write True/False.   **04**
1) Raspberry Pi can operate in headless mode.
2) The HDMI port on Raspberry Pi is used for network connectivity.
3) ADC/DAC can be interfaced with Raspberry Pi using GPIO.
4) RPi.GPIO library is a built-in C library.

Q.2 Answer the following. (Any Six)   **12**
   a) List any two differences between Raspberry Pi 3 and Raspberry Pi 4.
   b) Write the importance of SoC in Raspberry Pi.
   c) Write two uses of GPIO pins.
   d) What is headless mode in Raspberry Pi?
   e) Define PWM and mention one application.
   f) Give two advantages of using Python for Raspberry Pi programming.
   g) Write two examples of sensors that can be interfaced with Raspberry Pi.
   h) What is the use of Tkinter library?

Q.3 Answer the following. (Any Three)   **12**
   a) Explain the basic functionality of Raspberry Pi B+ board.
   b) Describe the steps to format an SD card and install an operating system.
   c) Explain GPIO input interfacing with push buttons.
   d) Write a short note on display interfacing (LCD/7-segment) with Raspberry Pi.

Q.4 Answer the following. (Any Two)   **12**
   a) Explain in detail the pin description of Raspberry Pi.
   b) Discuss file system and booting process of Raspberry Pi 4.
   c) Explain motor interfacing (DC, Stepper, Servo) using Raspberry Pi with examples.

Q.5 Answer the following. (Any Two)   **12**
   a) Explain ADC/DAC interfacing with Raspberry Pi.
   b) Describe remote access and headless operation of Raspberry Pi.
   c) Write a Python program to flash an LED using GPIO pins.

Seat No.		**Set**	**P**

M.Sc. (Electronics) (IOT) (Semester - III) (New) (NEP CBCS)
Examination: October/November – 2025
Fundamentals of Sensor Networks (2315302)

Day & Date: Friday, 31-10-2025 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
2) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. (MCQ) 08

1) IEEE 802.15.4 is a standard associated with _____.
a) Wired sensor networks b) Wi-Fi communication
c) Zigbee and WSNs d) NFC technology

2) In Bluetooth Low Energy (BLE), _____ is the typical data rate range.
a) Up to 1 Mbps b) 10-100 Mbps
c) 1-10 Gbps d) 100-500 kbps

3) _____ WSN application involves real-time data for crop management.
a) Traffic monitoring b) Health monitoring
c) Precision agriculture d) Pipeline monitoring

4) In WSN physical layer, _____ does channel encoding primarily help with.
a) Error detection and correction
b) Data compression
c) Signal amplification
d) Routing decisions

5) _____ protocol is commonly used for multi-drop communication in industrial wired sensor networks.
a) SPI b) I2C
c) RS-485 d) USB

6) _____ standard is used for current loop in industrial wired sensors.
a) SPI b) 4-20 mA
c) Ethernet d) LIN

7) NFC technology is primarily used for _____ range communication.
a) Long b) Medium
c) Short d) Ultra-long

8) _____ does channel encoding in WSN help prevent.
   a) Signal interference
   b) Data errors during transmission
   c) Network congestion
   d) Power consumption

B) Write True/False. 04
   1) IEEE 802.11 is optimized for low-power WSN.
   2) LTE is a cellular technology suitable for WSN in remote areas.
   3) HAN stands for Home Area Network in wireless technologies.
   4) In sensor networks, LoRa technology is suitable for long-range, low-power communications over large areas.

Q.2 Answer the following. (Any Six) 12
   a) List any Two protocol used in wired sensor networks.
   b) List two challenges of wired sensor networks.
   c) Write the frame format in WSN application layer.
   d) What is RFID and its architecture?
   e) Differentiate between star and bus topologies in wired networks.
   f) What is the role of CAN protocol in wired sensors?
   g) What is LTE and its role in wireless sensor technology?
   h) Give the two components of a health monitoring system using WSN.

Q.3 Answer the following. (Any Three) 12
   a) Describe standard WS nodes and their types.
   b) Explain protocol stacks like Modbus in wired systems.
   c) Explain timing issues in wired sensor networks.
   d) Describe the characteristics of network layers in a WSN.

Q.4 Answer the following. (Any Two) 12
   a) Explain the architecture of Bluetooth and Bluetooth Low Energy.
   b) Explain the architecture of Zigbee and its device addressing.
   c) Explain WSN application in health monitoring system.

Q.5 Answer the following. (Any Two) 12
   a) Describe wireless communication protocols overview for WSN.
   b) Discuss the network layer routing matrices in WSN.
   c) Explain the various network topologies used in wired sensor networks, such as mesh and Bus.

Seat No.	

Set **P**

M.Sc. (Electronics) (IOT) (Semester - III) (New) (NEP CBCS)
Examination: October/November – 2025
Programming in Python and Application Development (2315306)

Day & Date: Monday, 03-11-2025   Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
           2) Draw neat diagrams and write equations wherever necessary.
           3) Figures to the right indicate full marks.
           4) Use of log-tables and calculator is allowed.
           5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ)   **08**

  1) _____ Python operator is used for exponentiation.
    a) *   b) **
    c) ^   d) %

  2) The output of len([1, 2, 3]) in Python is _____.
    a) 1   b) 2
    c) 3   d) 4

  3) _____ NumPy function creates an array with a specified number of evenly spaced values.
    a) arange()   b) linspace()
    c) zeros()   d) ones()

  4) The purpose of the range() function in Python is to _____.
    a) Generate a list of numbers
    b) Define a variable
    c) Create a dictionary
    d) Open a file

  5) _____ method returns the number of items in a dictionary.
    a) count()   b) len()
    c) size()   d) length()

  6) In file handling, _____mode appends data to an existing file.
    a) 'r'   b) 'w'
    c) 'a'   d) 'x'

  7) _____ IoT application on Raspberry Pi uses RFID for vehicle detection.
    a) Smart Parking System   b) Weather Station Monitoring
    c) Healthcare Monitoring   d) Green House Automation

8) The default value of a variable in Python is _____ if not initialized.
   a) 0
   b) None
   c) False
   d) Empty string

B) Fill in the blanks. **04**
   1) The _____ function in Python converts a string to an integer.
   2) A _____ is a collection of key-value pairs in Python.
   3) The _____ method in NumPy creates an identity matrix.
   4) Python allows _____ assignment to multiple variables in one line.

Q.2 Answer the following. (Any Six) **12**
   a) What are the main differences between mutable and immutable data types?
   b) How does the continue statement work in a loop?
   c) What is the purpose of the append() method in lists?
   d) Discuss the role of the import statement in Python.
   e) What are the advantages of using NumPy for array operations?
   f) Write a Python program to print all even numbers from 1 to 10.
   g) Write a Python program to calculate the sum of digits in a given number (e.g., 123).
   h) Write a Python program to check if a number is positive or not for a given input (e.g.,10)

Q.3 Answer the following. (Any Three) **12**
   a) Discuss the concept of variable scope in Python with examples.
   b) Explain how exception handling improves code reliability.
   c) Outline the differences between lists, tuples, and sets in Python.
   d) Write a Python program to merge two dictionaries (e.g., {'a': 1, 'b': 2} and {'c': 3, 'd': 4}) and display the result.

Q.4 Answer the following. (Any Two) **12**
   a) Elaborate on the role of functions as first-class objects in Python.
   b) Discuss the use of file handling for reading and writing data in Python.
   c) Write a Python program to implement a linked list with insertion at the beginning and display the list (e.g., insert 1, 2, 3).

Q.5 Answer the following. (Any Two) **12**
   a) Discuss the implementation of IoT applications like Vehicle Tracking System on Raspberry Pi.
   b) Explain the concept of recursion with its advantages and disadvantages.
   c) Write a Python program to simulate a simple queue using a list with enqueue and dequeue operations (e.g., enqueue 1, 2, then dequeue)

Seat No.		Set	**P**

M.Sc. Electronics (IOT) (Semester - IV) (New) (NEP CBCS)
Examination: October/November - 2025
Data Analytics and Industrial IoT (2315401)

Day & Date: Tuesday, 28-10-2025   Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
         2) Draw neat diagrams and write equations wherever necessary.
         3) Figures to the right indicate full marks.
         4) Use of log-tables and calculator is allowed.
         5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ)   **08**

  1) In data modeling, what is the term for a visual representation of the relationship between different entities in a data?
      a) Data dictionary
      b) Data flow diagram
      c) Entity-Relationship diagram
      d) Data cube

  2) Which data modeling approach is primarily used for representing data in a tabular format with rows and columns?
      a) Relational modeling
      b) Hierarchal modeling
      c) Object oriented modeling
      d) Entity Relationship modeling

  3) Collection of information stored in a database at a particular moment is called ____.
      a) view   b) schema
      c) instance   d) All of these

  4) Which of the following is the RDBMS in use?
      a) Oracle   b) MySQL
      c) HeidiSQL   d) All of these

  5) Application of Machine Learning methods to large databases is called ____.
      a) Data mining   b) Artificial intelligence
      c) Big data analysis   d) Internet of things

  6) In which category does Linear Regression belongs to?
      a) Supervised learning   b) Unsupervised learning
      c) Both a and b   d) None of these

7) Which country government introduced the Industry 4.0 concept?
a) USA
b) France
c) Germany
d) UK

8) What is the term for a virtual representation of a physical asset in I-IoT?
a) Cloud server
b) digital twin
c) data logger
d) edge node

B) Fill in the blanks or Write True/False. 04
a) The "k" in K-means represents ____.
b) To clean and process data is the primary goal of data modeling in context of data science. (True or False)
c) Low-cost implementation is the advantage of Industry 4.0 (True or False).
d) ____ protocol is commonly used for I-IoT data communication.

Q.2 Answer the following. (Any Six) 12
a) What is database normalization?
b) List three main types of data models.
c) What are indexes in SQL?
d) What is data cleaning? Why it is important?
e) What is overfitting?
f) What is difference between Industry 4.0 and Lean manufacturing?
g) List the commonly used technologies used in I-IoT.
h) Give the definition of I-IoT.

Q.3 Answer the following. (Any Three) 12
a) What is database normalization? What are its benefits?
b) What is a Query in SQL? Give three examples of query.
c) Explain k-means in reference to data analysis.
d) What are the key technologies driving Industry 4.0, and how do they contribute to its success?

Q.4 Answer the following. (Any Two) 12
a) Explain different connectivity technologies used in I-IoT, with examples.
b) Explain the following terms in context to SQL - self join, view, sub-query, clustered index and select statement.
c) Describe the different types of data (e.g., numerical, categorical, structured, unstructured) and their relevance in data analysis.

Q.5 Answer the following. (Any Two) 12
a) Explain the core principles of Lean manufacturing. How they are implemented in a manufacturing environment, and the potential benefits of adopting these principles.

b) Explain the concept of Indexing in database and how it improves database performance. Discuss different types of Indexes.

c) Explain different communication protocols used in I-IoT and their suitability for various industrial applications.

Seat No.

Set **P**

M.Sc. Electronics (IOT) (Semester - IV) (New) (NEP CBCS)
Examination: October/November - 2025
Advanced Wireless Sensor Networks (2315402)

Day & Date: Thursday, 30-10-2025   Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) All questions are compulsory.
           2) Draw neat diagrams and write equations wherever necessary.
           3) Figures to the right indicate full marks.
           4) Use of log-tables and calculator is allowed.
           5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ)   08

1) LEACH protocol is based on: _____
   a) Direct transmission to the base station
   b) Flat routing with static clusters
   c) Hierarchical clustering with rotating cluster heads
   d) Ring-based data aggregation

2) SPIN protocol addresses the "implosion problem" by: _____
   a) Using data negotiation and metadata descriptors
   b) Creating fixed clusters
   c) Reducing transmission power
   d) Implementing sleep-wake cycles

3) Which attack involves a node creating multiple fake identities?
   a) Sybil attack   b) Wormhole attack
   c) Sinkhole attack   d) DoS attack

4) Secure aggregation focuses on: _____
   a) Encrypting node positions
   b) Preventing tampering during data fusion
   c) Managing battery usage
   d) Authenticating cluster heads

5) Which simulator is node-level and WSN-specific?
   a) MATLAB   b) NS-3
   c) OMNeT++   d) TOSSIM

6) EnviroTrack is used for: _____
   a) Secure aggregation
   b) Node localization
   c) Energy management
   d) Tracking environmental phenomena using sensor networks

7) Wireless Underground Sensor Networks are used in: _____
   a) Soil moisture monitoring in agriculture
   b) Underwater navigation
   c) Air quality monitoring
   d) Cloud computing

8) Actors in WSAN are responsible for: _____
   a) Aggregating data packets
   b) Performing actions based on sensor data
   c) Managing node energy
   d) Encrypting communication

B) True/False. **04**
   a) Mesh topology requires more energy than Star topology.
   b) Battery management schemes focus on optimizing node placement.
   c) Traffic management prioritizes non-critical data.
   d) Cross-layer design improves energy efficiency by integrating protocol layers.

Q.2 Answer the following. (Any Six) **12**
   a) What is the main purpose of the LEACH protocol?
   b) What is the role of a "battery management scheme"?
   c) Name two data dissemination strategies used in SPIN.
   d) Define "macro programming" in WSN.
   e) State two design issues of WSN operating systems.
   f) Why is authentication important in WSN?
   g) How does TinyGALS handle concurrency?
   h) Define "cross-layer design" in WSN.

Q.3 Answer the following. (Any Three) **12**
   a) List two challenges faced by Underwater Acoustic Sensor Networks.
   b) What is secure localization? Why is it critical in WSN?
   c) Discuss the challenges in dynamic programming for WSN.
   d) List two examples of WSN operating systems.

Q.4 Answer the following. (Any Two) **12**
   a) Explain the transmission power management scheme and its impact on WSN energy conservation.
   b) Describe the thread-based programming model and its limitations in WSN.
   c) How do multimedia sensors differ from traditional scalar sensors?

Q.5 Answer the following. (Any Two) **12**
   a) Discuss the challenges in designing an OS for resource-constrained WSN nodes.
   b) Explain the role of system power management in prolonging WSN lifetime.
   c) Evaluate the potential of WMSN in real-time surveillance and disaster management.

Seat No.

Set **P**

M.Sc. Electronics (IOT) (Semester - IV) (New) (NEP CBCS)
Examination: October/November – 2025
Java Programming For Mobile Application Development (2315406)

Day & Date: Saturday, 01-11-2025
Time: 11:00 AM To 01:30 PM

Max. Marks: 60

Instructions: 1) All questions are compulsory.
2) Draw neat diagrams and write equations wherever necessary.
3) Figures to the right indicate full marks.
4) Use of log-tables and calculator is allowed.
5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative. (MCQ) 08

1) What is the first step to start developing in Java?
   a) Compile the code
   b) Install Android Studio
   c) Install Java JDK
   d) Create a database

2) Which tool is required to run Java programs?
   a) Android Studio
   b) JRE
   c) SDK
   d) AVD

3) What is the purpose of Android Studio?
   a) Web development
   b) Java debugging only
   c) Developing Android apps
   d) Creating animations

4) Which component is needed to create an Android Project?
   a) AVD
   b) Java Class
   c) Manifest File
   d) Android Studio

5) What is a Fragment in Android?
   a) A part of the UI that can be reused
   b) A component that runs independently
   c) A type of layout
   d) A service used for background tasks

6) What is the first callback in Activity Lifecycle?
   a) onPause()
   b) onResume()
   c) onCreate()
   d) onStart()

7) What is AVD in Android Studio?
   a) Android Virtual Display
   b) Android Version Descriptor
   c) Android Virtual Device
   d) Advanced View Design

8) Which file is used for storing drawable?
   a) res/layout
   b) res/values
   c) res/drawable
   d) res/menu

    B)   **Write true/false.**   **04**
        1) Android apps can be developed using Java.
        2) Fragments can only exist inside an Activity.
        3) Activities cannot be declared in the Android Manifest file.
        4) Java support object-oriented programming.

Q.2   **Answer the following. (Any Six)**   **12**
    a)   What is the purpose of Android Manifest file?
    b)   Define Layout in Android.
    c)   How does a Java program execute?
    d)   What are the steps to create a new project in Android Studio?
    e)   What is the role of onAttach() in Fragment lifecycle?
    f)   Name the tool used to build Android apps.
    g)   How do you pass data between Fragments?
    h)   What is the importance of build.gradle and AndroidManifest.xml?

Q.3   **Answer the following. (Any Three)**   **12**
    a)   Explain the Android Development Framework in detail.
    b)   Describe the Android Application Lifecycle.
    c)   Discuss the process of creating and running a Java project in Android Studio.
    d)   Write a short note on Java Virtual Machine (JVM) and its importance in app execution.

Q.4   **Answer the following. (Any Two)**   **12**
    a)   Explain the complete process of installing Java JDK and configuring it.
    b)   Explain how Fragments can be used to create reusable UI components in Android.
    c)   Compare the structure of a standalone Java program vs an Android Java application.

Q.5   **Answer the following. (Any Two)**   **12**
    a)   Explain the complete process of creating and running a Java project in Android Studio.
    b)   Describe the use of Gradle in Android development.
    c)   Explain the advantages of using Java for Android application development.