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**M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)**  
**Examination: March/April – 2026**  
**Hardware, Programming and IDE tools - AVR & PIC Series**  
**(2315101)**

Day &amp; Date: Friday, 17-04-2026

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.

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

- 1) Total \_\_\_\_\_ General Purpose Registers are present in ATmega328.
 

a) 16	b) 32
c) 64	d) 8
- 2) In PIC 16C, \_\_\_\_\_ register controls the interrupt enable bits.
 

a) INTCON	b) STATUS
c) OPTION	d) PCL
- 3) WinAVR is a tool primarily for \_\_\_\_\_.
 

a) PIC simulation	b) AVR GCC compiler
c) Arduino libraries	d) Python scripting
- 4) For Embedded C in PIC, the TRIS register is used for \_\_\_\_\_.
 

a) Data direction	b) Port output
c) Port input	d) Timer control
- 5) The USART in AVR is used for \_\_\_\_\_.
 

a) Parallel communication	b) Serial communication
c) Analog input	d) PWM generation
- 6) In PIC 16C, the Power-UP Timer is used for \_\_\_\_\_.
 

a) Delay after reset	b) Interrupt timing
c) ADC conversion	d) EEPROM write
- 7) Micro C IDE is suitable for \_\_\_\_\_.
 

a) AVR assembly	b) Java development
c) MATLAB simulation	d) PIC C programming
- 8) The Sleep Mode in PIC 16C reduces \_\_\_\_\_.
 

a) Memory usage	b) Clock speed
c) Power consumption	d) Interrupt priority

- B) Fill in the blanks. 04**
- 1) The PIC 16C has \_\_\_\_\_ architecture.
  - 2) AVR Studio supports \_\_\_\_\_ programming for PIC.
  - 3) The Stack in PIC 16C is \_\_\_\_\_ levels deep.
  - 4) The On-Chip DAC in ATmega328 is \_\_\_\_\_ resolution.

- Q.2 Answer the following. (Any Six) 12**
- a) What is the Interrupt Sources in AVR / PIC?
  - b) Write the function of EEPROM in AVR / PIC.
  - c) What is the role of the Analog Comparator in AVR/ PIC.
  - d) Differentiate between Timer and Counter in AVR / PIC.
  - e) What is the Clock Circuit in ATmega328 / PIC16C.
  - f) Write the Pin Description of ATmega328 / PIC16C.
  - g) What is the role of General Purpose Registers in AVR?
  - h) Write the role of the W Register in PIC 16C.

- Q.3 Answer the following. (Any Three) 12**
- a) Discuss I/O Ports programming in AVR / PIC 16C with examples.
  - b) Write and explain an Embedded C program for AVR / PIC to toggle an LED connected to a PORT with a 2-second delay.
  - c) Write a brief note on watch dog timer in AVR.
  - d) Explain Various types of memory of AVR/PIC

- Q.4 Answer the following. (Any Two) 12**
- a) Write an Embedded C program for AVR /PIC to perform arithmetic addition on two numbers.
  - b) Explain Time Delay Programming in AVR / PIC with a loop-based example.
  - c) Explain Detailed architecture of ATmega328/ PIC 16C with a neat diagram.

- Q.5 Answer the following. (Any Two) 12**
- a) Write a program for AVR / PIC to handle a timer interrupt for overflow.
  - b) Write an Embedded C program for AVR / PIC 16C. Create different patterns on LEDs connected to port D and change the patterns based on input from port C.
  - c) Discuss Logical Operation Programming in AVR /PIC with bitwise examples.

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**M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)**  
**Examination: March/April - 2026**  
**Sensors and Actuators (2315102)**

Day & Date: Monday, 20-04-2026  
 Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

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

**08**

- 1) \_\_\_\_\_ material is widely used for sensor fabrication due to its semiconductor properties.
  - a) Ceramics
  - b) Silicon
  - c) Plastics
  - d) Glasses
- 2) \_\_\_\_\_ characteristic of a sensor indicates its ability to reproduce the same output for a given input.
  - a) Sensitivity
  - b) Repeatability
  - c) Resolution
  - d) Accuracy
- 3) \_\_\_\_\_ transducer operates on the principle of inductance.
  - a) Strain gauge
  - b) LVDT
  - c) Thermistor
  - d) Capacitive pressure sensor
- 4) \_\_\_\_\_ microsensor is designed to detect biological substances.
  - a) Biosensor
  - b) Acceleration Microsensor
  - c) Pressure Microsensor
  - d) Flow Microsensor
- 5) \_\_\_\_\_ effect in micro actuators allows movement through mechanical stress reversal.
  - a) Pseudo elasticity
  - b) Shape Memory Effect
  - c) Electrostatic Effect
  - d) Inverse Piezo effect
- 6) \_\_\_\_\_ processing technique involves using a mask to pattern Silicon.
  - a) Photolithography
  - b) Electroplating
  - c) Sputtering
  - d) Chemical Vapour Deposition
- 7) \_\_\_\_\_ actuator type is used for rapid linear motion in automation.
  - a) DC Motor
  - b) Servo Motor
  - c) Stepper Motor
  - d) Solenoid
- 8) \_\_\_\_\_ is the primary function of a thermistor as a transducer.
  - a) Measure displacement
  - b) Measure temperature
  - c) Detect strain
  - d) Sense humidity

**B) Fill in the blanks. 04**

- 1) The \_\_\_\_\_ of a sensor defines the smallest detectable change in input.
- 2) Piezoelectric actuators convert electrical signals into \_\_\_\_\_ movements.
- 3) \_\_\_\_\_ micromachining involves etching the entire silicon substrate.
- 4) \_\_\_\_\_ deposition is a technique that involves evaporating materials in a vacuum.

**Q.2 Answer the following. (Any Six) 12**

- a) Define the difference between a sensor and a transducer.
- b) What are the selection criteria for actuators?
- c) Write the basic working principle of a strain gauge.
- d) List two examples of force microsensors.
- e) Define the principle of operation for a capacitive pressure sensor.
- f) What are the types of linear actuators?
- g) Define the working of a three-phase induction motor.
- h) What are the application of a capacitor microphone?

**Q.3 Answer the following. (Any Three) 12**

- a) Define sensitivity and repeatability in the context of sensors, giving examples.
- b) Discuss the principle of operation of a capacitive transducer.
- c) Explain the construction of a solenoid actuator.
- d) Explain the Outline the bulk silicon micromachining process.

**Q.4 Answer the following. (Any Two) 12**

- a) Describe the classification of sensors based on their output.
- b) Explain the role of silicon in sensor material processing.
- c) Discuss the principle and applications of inductive transducers like LVDT.

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

- a) Explain the working principle of a stepper motor and its uses in precise positioning.
- b) Describe the selection and characteristics of primary measuring elements.
- c) Explain the role of nanomaterials in enhancing sensor sensitivity.

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**M.Sc. Electronics (IOT) (Semester - I) (New) (NEP CBCS)  
Examination: March/April – 2026  
Programming with C and C++ (2315107)**

Day & Date: Wednesday, 22-04-2026  
Time: 03:00 PM To 05:30 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) Multiple Choice Question.**

**08**

- 1) \_\_\_\_\_ of the following is a decision-making statement in C?
  - a) for
  - b) while
  - c) if-else
  - d) goto
- 2) \_\_\_\_\_ header file is required for strlen() function in C?
  - a) stdlib.h
  - b) string.h
  - c) math.h
  - d) stdio.h
- 3) In C++, \_\_\_\_\_ function is called when an object goes out of scope?
  - a) Constructor
  - b) Destructor
  - c) Virtual function
  - d) Friend function
- 4) \_\_\_\_\_ type of inheritance involves multiple base classes and one derived class?
  - a) Multilevel
  - b) Multiple
  - c) Hierarchical
  - d) Hybrid
- 5) \_\_\_\_\_ of the following is not a valid preprocessor directive?
  - a) #include
  - b) #define
  - c) #macro
  - d) #ifdef
- 6) \_\_\_\_\_ operator is used to access members of a class object in C++?
  - a) .
  - b) →
  - c) ::
  - d) \*\*
- 7) \_\_\_\_\_ function in C is used to close a file?
  - a) closefile()
  - b) fclose()
  - c) endfile()
  - d) stopfile()
- 8) \_\_\_\_\_ keyword is used to declare a class in C++?
  - a) struct
  - b) object
  - c) class
  - d) type

- B) State True or False. 04**
- 1) Arrays in C always start with index 1.
  - 2) #include is a preprocessor directive.
  - 3) C++ supports multiple inheritance.
  - 4) Inline functions reduce function call overhead.

- Q.2 Answer the following. (Any Six) 12**
- a) Define pointers and give example.
  - b) What is a preprocessor directive? Give two examples.
  - c) Explain unions in C with example.
  - d) Write a short note on default constructor.
  - e) Define pure virtual function.
  - f) Explain polymorphism in C++.
  - g) What are manipulators in C++? Give examples.
  - h) Explain error handling during file operations.

- Q.3 Answer the following. (Any Three) 12**
- a) Explain call by reference with example in C.
  - b) Discuss copy constructor in C++.
  - c) Write a C++ program to add two complex numbers using operator overloading.
  - d) Describe function templates with syntax and example.

- Q.4 Answer the following. (Any Two) 12**
- a) Write a program in C to demonstrate use of structures.
  - b) Explain dynamic constructors in C++ with example.
  - c) Discuss multilevel inheritance with diagram and example.

- Q.5 Answer the following. (Any Two) 12**
- a) Explain formatted and unformatted I/O operations in C++.
  - b) Write a program in C++ to demonstrate use of friend function.
  - c) Explain the concept of polymorphism using virtual functions.

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**M.Sc. (Electronics) (IOT) (Semester - I) (New) (NEP CBCS)  
Examination: March/April - 2026  
Research Methodology (2315103)**

Day & Date: Friday, 24-04-2026  
Time: 03:00 PM To 05:30 PM

Max. Marks: 60

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

**Q.1 A) Choose correct answer.**

**08**

- 1) The main objective of research is \_\_\_\_\_.
  - a) To find out the truth
  - b) To increase knowledge
  - c) To solve problems
  - d) All of the above
- 2) A research which is carried out to explore new facts is called \_\_\_\_\_.
  - a) Descriptive
  - b) Exploratory
  - c) Experimental
  - d) Analytical
- 3) \_\_\_\_\_ of the following is NOT a characteristic of good research.
  - a) Systematic
  - b) Replicable
  - c) Based on assumptions without evidence
  - d) Logical
- 4) Hypothesis is \_\_\_\_\_.
  - a) A proven fact
  - b) A tentative assumption
  - c) A universal law
  - d) A statistical test
- 5) A variable which can be controlled or manipulated in an experiment is \_\_\_\_\_.
  - a) Dependent variable
  - b) Independent variable
  - c) Controlled variable
  - d) Confounding variable
- 6) \_\_\_\_\_ is a qualitative research method.
  - a) Case study
  - b) Survey
  - c) Experiment
  - d) Hypothesis testing
- 7) Pie chart is generally used for \_\_\_\_\_.
  - a) Time series data
  - b) Percentage distribution
  - c) Correlation analysis
  - d) Chi-square test
- 8) \_\_\_\_\_ of the following is NOT included in 7Cs of effective research writing.
  - a) Clarity
  - b) Completeness
  - b) Cost effectiveness
  - d) Courtesy

- B) State True or False.** **04**
- 1) Deductive reasoning moves from general to specific.
  - 2) Literature review is not necessary in research.
  - 3) Interview is a method of data collection.
  - 4) Synopsis writing is the same as report writing.

- Q.2 Answer the following. (Any Six)** **12**
- a) Define research and state its objectives.
  - b) Differentiate between exploratory and descriptive research.
  - c) State the criteria of good research.
  - d) Define research problem. Why is it necessary to define a problem?
  - e) What is a null hypothesis?
  - f) Define sampling. Write characteristics of a good sample.
  - g) What is a research design?
  - h) Explain the importance of literature review.

- Q.3 Answer the following. (Any Three)** **12**
- a) Explain the process of hypothesis testing.
  - b) Discuss features of good research design.
  - c) Explain data collection methods.
  - d) Explain the concept of inductive and deductive theory.

- Q.4 Answer the following. (Any Two)** **12**
- a) Explain qualitative vs. quantitative research approaches.
  - b) Explain various rating scales used in data collection.
  - c) Write in detail the characteristics of scientific method

- Q.5 Answer the following. (Any Two)** **12**
- a) Write steps in research process.
  - b) Discuss the structure and importance of thesis writing.
  - c) Explain the 7Cs of effective research writing.

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**M.Sc. Electronics (IOT) (Semester - II) (New) (NEP CBCS)**  
**Examination: March/April – 2026**  
**Interfacing and Embedded System Design using – AVR and PIC**  
**Microcontrollers (2315201)**

Day & Date: Thursday, 16-04-2026  
 Time: 03:00 PM To 05:30 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.

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

- 1) Embedded systems are mainly used in \_\_\_\_\_.  
 a) Specific applications                      b) Gaming  
 c) Networking                                      d) Programming only
- 2) 8051 microcontroller belongs to \_\_\_\_\_ architecture.  
 a) Harvard    b) Von Neumann  
 c) Both    d) None
- 3) Interrupt is used for \_\_\_\_\_.  
 a) Delay    b) Immediate response  
 c) Storage    d) Display
- 4) DAC converts \_\_\_\_\_.  
 a) Analog to digital                                      b) Digital to analog  
 c) Voltage to frequency                                      d) Frequency to voltage
- 5) Opto-isolator is used for \_\_\_\_\_.  
 a) Amplification    b) Isolation  
 c) Conversion    d) Storage
- 6) Servo motor is used for \_\_\_\_\_.  
 a) High speed rotation                                      b) Precise angle control  
 c) Heating    d) Cooling
- 7) H-Bridge is used for \_\_\_\_\_.  
 a) Display    b) Motor direction control  
 c) Data storage    d) Interrupt
- 8) RTC is used for \_\_\_\_\_.  
 a) Data storage    b) Time keeping  
 c) Motor control    d) Display

- B) Write True or False. 04**
- a) Embedded C is used for programming microcontrollers.
  - b) ADC converts digital signal to analog.
  - c) Relay is an electromechanical switch.
  - d) PIC microcontroller supports PWM.

- Q.2 Answer the following. (Any Six) 12**
- a) What is signal conditioning?
  - b) Define interrupt.
  - c) What is relay?
  - d) What is DAC?
  - e) Define servo motor.
  - f) What is AVR microcontroller?
  - g) What is PIC microcontroller?
  - h) What is dot matrix display?

- Q.3 Answer the following. (Any Three) 12**
- a) Explain Embedded C structure with example.
  - b) Explain keyboard interfacing.
  - c) Explain LCD and 7-segment display interfacing.
  - d) Explain solenoid and its working.

- Q.4 Answer the following. (Any Two) 12**
- a) Explain AVR based Electronic Weighing System.
  - b) Explain Stepper Motor control with program.
  - c) Explain RTC DS1307 interfacing with microcontroller.

- Q.5 Answer the following. (Any Two) 12**
- a) Explain Elevator system design using PIC.
  - b) Explain 3D LED Cube design.
  - c) Explain Scrolling display system for advertising.

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**M.Sc. Electronics (IOT) (Semester - II) (New) (NEP CBCS)**  
**Examination: March/April – 2026**  
**Fundamentals of Internet of Things (2315202)**

Day & Date: Saturday, 18-04-2026  
 Time: 03:00 PM To 05:30 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) Which of the following is a lightweight publish-subscribe messaging protocol used in IoT?
  - a) HTTP
  - b) MQTT
  - c) FTP
  - d) SMTP
- 2) IPv6 uses how many bits for addressing?
  - a) 32 bits
  - b) 64 bits
  - c) 128 bits
  - d) 256 bits
- 3) What does WSN stand for?
  - a) Wide Sensor Network
  - b) Wireless Sensor Network
  - c) Wired Signal Node
  - d) Wireless Signal Net
- 4) FANET is a subset of which type of network?
  - a) VANET
  - b) MANET
  - c) LAN
  - d) WAN
- 5) Which function in Arduino IDE executes once during startup?
  - a) loop()
  - b) setup()
  - c) start()
  - d) init()
- 6) Raspberry Pi primarily uses which operating system?
  - a) Windows
  - b) macOS
  - c) Linux-based OS
  - c) Android
- 7) SDN stands for: \_\_\_\_\_.
  - a) System Data Node
  - b) Secure Data Network
  - c) Software Defined Networking
  - d) Standard Device Node

- 8) In cloud computing, SaaS stands for: \_\_\_\_\_.
- a) Storage as a Service      b) Software as a Service  
c) System as a Service      d) Security as a Service

**B) Fill in the blanks.****04**

- a) The IoT communication protocol designed for constrained devices and networks is \_\_\_\_\_.
- b) The algorithm used for Optimal Geographical Density Control in WSN is \_\_\_\_\_.
- c) In Raspberry Pi, the function used to set a GPIO pin as output in Python is \_\_\_\_\_.
- d) \_\_\_\_\_ is the cloud service model that provides ready-to-use software applications over the internet.

**Q.2 Answer the following. (Any Six)****12**

- a) What are the key characteristics of IoT? List any four.
- b) Differentiate between IPv4 and IPv6 with respect to IoT.
- c) Define Wireless Sensor Network (WSN). State its basic components.
- d) What is Machine-to-Machine (M2M) communication? Give two examples.
- e) List any four data types supported in Arduino programming with examples.
- f) What is the purpose of GPIO pins in Raspberry Pi? List any four types of pins.
- g) State any four benefits of integrating SDN in IoT.
- h) What is Infrastructure as a Service (IaaS)? Give two real-world examples.

**Q.3 Answer the following. (Any Three)****12**

- a) Explain MQTT and CoAP communication protocols used in IoT. Compare their features.
- b) Describe the OGDC (Optimal Geographical Density Control) algorithm. Explain its role in Wireless Multimedia Sensor Networks (WMSN).
- c) Write an Arduino program to blink an LED at 1-second intervals. Explain the role of setup() and loop() functions.
- d) Explain the NIST visual model of cloud computing. State the five essential characteristics of cloud computing.

**Q.4 Answer the following. (Any Two)****12**

- a) Explain the IoT architecture in detail. Discuss the key technologies involved in IoT implementation and the challenges faced during deployment.
- b) What is a UAV Network? Explain UAV network topology and Flying Ad-hoc Networks (FANETs) in detail. Also compare FANETs and VANETs.
- c) Explain the IoT implementation in a Smart Home. Describe the components, working, and benefits with a suitable block diagram or example.

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

- a)** Explain the basic architecture and pin configuration of Raspberry Pi. How is sensor-actuator interfacing done? Write a sample program for a relay module with Raspberry Pi.
- b)** Explain the three cloud computing service models — SaaS, PaaS, and IaaS — with their architecture, features, and working methodology.
- c)** Describe Zigbee and 6LoWPAN communication protocols. Compare their features and explain their role in IoT communication.



- B) Fill in the blanks Or True/False. 04**
- 1) loop() function executes \_\_\_\_\_.
  - 2) I2C requires \_\_\_\_\_ resistors.
  - 3) ESP32 supports Bluetooth. (True/False)
  - 4) SX1278 uses high power consumption. (True/False)
- Q.2 Answer the following. (Any Six) 12**
- a) Define function overloading in Arduino (C++).
  - b) What is string concatenation?
  - c) Define PWM resolution.
  - d) What is deep sleep mode in ESP8266?
  - e) Define RSSI in LoRa.
  - f) What is Serial.available()?
  - g) Define edge triggering in interrupts.
  - h) What is clock stretching in I2C?
- Q.3 Answer the following. (Any Three) 12**
- a) Explain string vs character array.
  - b) Explain serial communication with example.
  - c) Explain Node MCU GPIO pin mapping.
  - d) Explain LoRa advantages over WiFi.
- Q.4 Answer the following. (Any Two) 12**
- a) Differentiate between string (character array) and String object.
  - b) Explain analog vs digital signal processing in Arduino.
  - c) Explain I2C data frame structure.
- Q.5 Answer the following. (Any Two) 12**
- a) Describe Node MCU and its features.
  - b) Explain DC motor control using PWM and driver IC.
  - c) Explain PIR sensor interfacing and working.

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**M.Sc. Electronics (IoT) (Sem - III) (New) (NEP CBCS) Examination:  
March/April – 2026  
Introduction to Raspberry Pi (2315301)**

Day & Date: Friday, 17-04-2026  
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.

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

- 1) Raspberry Pi was first introduced in the year \_\_\_\_\_.
  - a) 2008
  - b) 2015
  - c) 2012
  - d) 2018
- 2) \_\_\_\_\_ component provides power to the Raspberry Pi.
  - a) HDMI port
  - b) Micro-USB/USB-C connector
  - c) Ethernet port
  - d) Audio jack
- 3) \_\_\_\_\_ operating system is most commonly used with Raspberry Pi?
  - a) Raspbian (Raspberry Pi OS)
  - b) Ubuntu
  - c) Windows 10
  - d) Fedora
- 4) Remote access to Raspberry Pi can be achieved using \_\_\_\_\_.
  - a) USB
  - b) HDMI
  - c) SSH
  - d) GPIO
- 5) The general purpose of GPIO pins is to \_\_\_\_\_.
  - a) Provide internet connectivity
  - b) Control external hardware
  - c) Store data
  - d) Display graphics
- 6) \_\_\_\_\_ type of signal is generated using PWM.
  - a) Analog
  - b) Digital with varying duty cycle
  - c) Pure sine wave
  - d) Noise
- 7) \_\_\_\_\_ of the following is an example of a sensor used with Raspberry Pi.
  - a) Temperature sensor
  - b) Humidity sensor
  - c) PIR motion sensor
  - d) All of the above

- 8) \_\_\_\_\_ display device can be interfaced with Raspberry Pi.
- a) Seven segment display
  - b) LCD display
  - c) OLED display
  - d) All of the above

**B) Write True/False****04**

- 1) Raspberry Pi requires an SD card to boot the operating system.
- 2) Bash is a graphical user interface.
- 3) Python can be used to control GPIO pins in Raspberry Pi.
- 4) Stepper motors cannot be controlled using Raspberry Pi.

**Q.2 Answer the following. (Any Six)****12**

- a) State two applications of Raspberry Pi.
- b) Write two advantages of SoC architecture.
- c) Define GPIO.
- d) What is meant by remote access?
- e) List two uses of Bash command line in Raspberry Pi.
- f) Mention two functions of PWM signals.
- g) Give two examples of display devices used with Raspberry Pi.
- h) List two Python libraries used for Raspberry Pi programming.

**Q.3 Answer the following. (Any Three)****12**

- a) Explain on-board components of Raspberry Pi.
- b) Describe the steps to boot Raspberry Pi 4 with an SD card.
- c) Explain push button and matrix keyboard interfacing with Raspberry Pi.
- d) Explain sensor interfacing (temperature/humidity/PIR) with Raspberry Pi.

**Q.4 Answer the following. (Any Two)****12**

- a) Explain operating Raspberry Pi in headless mode with steps.
- b) Describe GPIO library functions in Python.
- c) Explain servo motor interfacing with Raspberry Pi.

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

- a) Explain LCD interfacing with Raspberry Pi using Python.
- b) Write a Python program to read input from a push button.
- c) Explain in detail remote access methods (SSH/VNC) of Raspberry Pi.

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**M.Sc. (Electronics) (IOT) (Semester - III) (New) (NEP CBCS)**  
**Examination: March/April – 2026**  
**Fundamentals of Sensor Networks (2315302)**

Day & Date: Monday, 20-04-2026  
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

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

- 1) \_\_\_\_\_ device is responsible for coordinating data collection and transmission in a WSN.
  - a) End Device
  - b) Repeater
  - c) Gateway
  - d) Coordinator
- 2) Cross-layer design in WSN improves \_\_\_\_\_.
  - a) Node battery size
  - b) Coordination between protocol layers for efficiency
  - c) Physical durability of sensors
  - d) Encryption standards
- 3) Wireless Sensor Networks (WSN) are primarily characterized by \_\_\_\_\_.
  - a) Wired data transmission
  - b) High energy consumption
  - c) Large node mobility
  - d) Low power consumption
- 4) The ISM band commonly used for WSNs is intended for \_\_\_\_\_.
  - a) Industrial, Scientific, and Medical use
  - b) Personal Area Networks
  - c) Satellite communication
  - d) Military applications
- 5) \_\_\_\_\_ technology is commonly used for contactless payment systems.
  - a) LoRa
  - b) RFID
  - c) CAN
  - d) UART
- 6) In \_\_\_\_\_ topology are all nodes connected to a central hub.
  - a) Ring
  - b) Star
  - c) Bus
  - d) Mesh
- 7) \_\_\_\_\_ protocol operates at the MAC layer in WSNs.
  - a) TCP
  - b) IEEE 802.15.4
  - c) Ethernet
  - d) USB

- 8) \_\_\_\_\_ of the following is NOT a characteristic of wired sensor networks.
- High data transmission rates
  - Limited mobility
  - High power consumption
  - Complex installation and maintenance

**B) Fill in the blanks. 04**

- \_\_\_\_\_ simulators evaluate node-level performance.
- In sensor networks, \_\_\_\_\_ technology is suitable for long-range, low-power communications over large areas.
- A \_\_\_\_\_ attack disrupts network services by flooding nodes with traffic.
- \_\_\_\_\_ is a wired communication protocol widely used for connecting sensors in embedded systems.

**Q.2 Answer the following. (Any Six) 12**

- Define wired sensor network and list two applications.
- Give the difference between UART and USART.
- What is the role of End Device in WSN architecture?
- What is device addressing in Zigbee?
- Give two challenges in health monitoring using WSN.
- Give the purpose of TCP/IP protocol stack in sensor networks.
- What is source encoding in WSN physical layer?
- What is sensor interfacing in wired nodes?

**Q.3 Answer the following. (Any Three) 12**

- Explain synchronization issues in wired sensor networks.
- Give the types of Wireless Sensor Networks.
- What are the main characteristics of the ISM band used in WSN protocols?
- Briefly explain the network layers for Wired Sensor Network.

**Q.4 Answer the following. (Any Two) 12**

- Describe the SPIN protocol and its data dissemination strategies. How does it address the “implosion problem”.
- Explain the various network topologies used in wired sensor networks, such as star and ring.
- Explain wired communication protocols SPI, I2C, and CAN

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

- Explain how Wireless Sensor Networks are applied in Air Quality monitoring systems.
- Analyze the challenges in deploying WSNs in extreme environments (e.g., underwater, underground)
- Describe the applications and challenges of wired sensor networks.



- 7) In data structures, \_\_\_\_\_ operation removes an element from the top of a stack.
- a) Push
  - b) Dequeue
  - c) Enqueue
  - d) Pop
- 8) \_\_\_\_\_ IoT application using Raspberry Pi involves monitoring environmental conditions for plant growth.
- a) Healthcare Monitoring
  - b) Smart Parking System
  - c) Green House Automation System
  - d) Vehicle Tracking System

**B) Fill in the blanks.****04**

- 1) Python is an \_\_\_\_\_ language, meaning code is executed line by line.
- 2) The \_\_\_\_\_ module in Python is used for working with arrays in NumPy.
- 3) A \_\_\_\_\_ function in Python calls itself to solve a problem.
- 4) In linked lists, the process of adding a node at the beginning is called \_\_\_\_\_.

**Q.2 Answer the following. (Any Six)****12**

- a) List two features of Python.
- b) What are identifiers in Python? Give an example.
- c) Write the 'if-else' statement with syntax.
- d) What are the advantages of using tuples over lists?
- e) Differentiate between a function and a method.
- f) What is the 'with' statement used for in file handling?
- g) Define a stack data structure.
- h) What is MQTT in the context of Raspberry Pi IoT?

**Q.3 Answer the following. (Any Three)****12**

- a) Discuss comparisons between C and Python.
- b) Explain nested loops in Python with an example.
- c) Describe how to create multi-dimensional arrays using NumPy.
- d) Write a Python program to check if a given string is a palindrome (e.g., "radar").

**Q.4 Answer the following. (Any Two)****12**

- a) Write a note on data types in Python, including sequences and sets.
- b) Discuss control statements like while and for loops, with examples.
- c) Write a Python program to implement a binary search on a sorted list (e.g., [1, 3, 5, 7, 9] for target 7).

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

- a) Describe flavors of Python and writing simple programs.
- b) Discuss stacks and queues, including operations.
- c) Explain IoT applications like Healthcare Monitoring and Home Automation using Raspberry Pi.

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**M.Sc. Electronics (IOT) (Semester - IV) (New) (NEP CBCS)  
Examination: March/April – 2026  
Data Analytics and Industrial IoT (2315401)**

Day & Date: Thursday, 16-04-2026  
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) Which of the following is the correct order of Database Architecture levels?
  - a) Physical → Conceptual → External
  - b) External → Conceptual → Physical
  - c) Conceptual → Physical → External
  - d) External → Physical → Conceptual
- 2) In ER modelling, a relationship that involves three entity types is called \_\_\_\_\_.
  - a) Binary
  - b) Unary
  - c) Ternary
  - d) Quaternary
- 3) Which SQL command is used to remove a table permanently from the database?
  - a) DELETE
  - b) DROP
  - c) TRUNCATE
  - d) REMOVE
- 4) Which SQL clause is used to filter grouped data?
  - a) WHERE
  - b) ORDER BY
  - c) HAVING
  - d) GROUP BY
- 5) In machine learning, which algorithm draws a hyperplane to separate classes?
  - a) K-Means
  - b) Decision Tree
  - c) Linear Regression
  - d) Support Vector Machine (SVM)
- 6) What does HDFS stand for in the Big Data ecosystem?
  - a) Hadoop Distributed File System
  - b) High Density File Storage
  - c) Hybrid Data Flow System
  - d) Hierarchical Data File Standard

- 7) Which Industry 4.0 technology creates a digital replica of a physical system?  
 a) Augmented Reality                      b) Digital Twin  
 c) Blockchain                                  d) Edge Computing
- 8) In IIoT architecture, which layer is responsible for data collection from machines?  
 a) Processing Layer                          b) Communication Layer  
 c) Sensing Layer                              d) Analytics Layer

**B) Fill in the blanks or Write True/False. 04**

- a) The \_\_\_\_\_ model represents data as a collection of tables with rows and columns.  
 b) The SQL constraint that ensures no two rows have the same value in a column is \_\_\_\_\_.  
 c) The machine learning technique that groups data without labelled training examples is \_\_\_\_\_.  
 d) \_\_\_\_\_ production systems focus on eliminating waste and improving efficiency in manufacturing.

**Q.2 Answer the following. (Any Six) 12**

- a) Explain the purpose of a Database Management System (DBMS). State any four advantages over file-based systems.  
 b) Differentiate between an Entity and an Attribute in ER modelling with suitable examples.  
 c) What are Integrity Constraints in a relational database? State and explain any two types.  
 d) Explain the use of SQL HAVING clause with an example. How does it differ from WHERE?  
 e) Define Classification in machine learning. Give two real-life application examples.  
 f) What is the role of Apache Kafka in a Big Data pipeline? Explain briefly.  
 g) What is a Cyber-Physical System (CPS)? State its key components and role in Industry 4.0.  
 h) Define IIoT. How does it differ from consumer IoT? Give two industrial application examples.

**Q.3 Answer the following. (Any Three) 12**

- a) Explain the concept of Specialization, Generalization, and Aggregation in Extended ER Diagrams with suitable examples.  
 b) Explain DDL and DML commands in SQL with syntax and at least two examples each.  
 c) Explain the Decision Tree algorithm. How is the tree built? State its advantages and limitations.  
 d) Discuss Smart Factories in Industry 4.0. Explain the role of AI, Big Data, and augmented reality in making factories smart.

**Q.4 Answer the following. (Any Two) 12**

- a) Explain the three-level architecture of a DBMS (Physical, Conceptual, External). Discuss data independence and the role of schemas and instances.
- b) Write SQL queries for:
  - i) Creating a table with constraints
  - ii) Creating and querying a View
  - iii) Using LIKE, BETWEEN, and IN operators,
  - iv) Handling NULL values with IS NULL and COALESCE
- c) Explain IIoT Sensing, Processing, and Communication layers in detail. Give examples of sensors, protocols, and gateways used in industrial environments.

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

- a) Explain the Machine Learning model building process: data collection, training, testing, and validation. Explain the role of confusion matrix and cross-validation in model performance evaluation.
- b) Explain the concept of Industry 4.0 and the Fourth Industrial Revolution. Discuss LEAN production, smart and connected business perspective, and the role of Collaborative Platforms and PLM.
- c) Explain IIoT Security threats and countermeasures. Discuss the role of Fog Computing and Cloud Computing in IIoT. Describe an IIoT application in Milk Processing and Packaging Industry.

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**M.Sc. Electronics (IOT) (Semester - IV) (New) (NEP CBCS)**  
**Examination: March/April – 2026**  
**Advanced Wireless Sensor Networks (2315402)**

Day & Date: Saturday, 18-04-2026  
 Time: 11:00 AM To 01:30 PM

Max. Marks: 60

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

**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 WSN are responsible for: \_\_\_\_\_.  
 a) Aggregating data packets  
 b) Performing actions based on sensor data  
 c) Managing node energy  
 d) Encrypting communication

**B) Write True/False. 04**

- 1) Mesh topology requires more energy than Star topology.
- 2) Battery management schemes focus on optimizing node placement.
- 3) Traffic management prioritizes non-critical data.
- 4) 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.

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Set **P**

**M.Sc. Electronics (IOT) (Semester - IV) (New) (NEP CBCS)**  
**Examination: March/April – 2026**  
**Java Programming for Mobile Application Development (2315406)**

Day & Date: Tuesday, 21-04-2026  
 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) Java was developed by \_\_\_\_\_.
  - a) Microsoft
  - b) Sun Microsystems
  - c) Apple
  - d) Google
- 2) Which symbol is used to create object?
  - a) class
  - b) new
  - c) object
  - d) create
- 3) Android applications are mainly written in \_\_\_\_\_.
  - a) C
  - b) C++
  - c) Java
  - d) Python
- 4) Which file contains Android application information?
  - a) MainActivity.java
  - b) AndroidManifest.xml
  - c) Layout.xml
  - d) Strings.xml
- 5) Which layout arranges components in rows and columns?
  - a) Linear Layout
  - b) Relative Layout
  - c) Grid Layout
  - d) Frame Layout
- 6) Fragment lifecycle method is \_\_\_\_\_.
  - a) onCreate()
  - b) onStart()
  - c) onDestroy()
  - d) All of these
- 7) Explicit Intent is used to start \_\_\_\_\_.
  - a) Specific Activity
  - b) Any Activity
  - c) Service only
  - d) Broadcast only
- 8) Exception is \_\_\_\_\_.
  - a) Runtime error
  - b) Compile time error
  - c) Logical error
  - d) Syntax error

**B) Write True/False. 04**

- 1) Java supports platform independence.
- 2) Android OS is open source.
- 3) Fragment can run without Activity.
- 4) Broadcast Receiver receives broadcast messages.

**Q.2 Answer the following. (Any Six) 12**

- a) Write features of Java.
- b) What is JDK and JRE?
- c) What is Android Studio?
- d) Define Activity.
- e) What is the role of onAttach() in Fragment lifecycle?
- f) Define Intent Filter.
- g) What is Looping in Java?
- h) Define Package in Java

**Q.3 Answer the following. (Any Three) 12**

- a) Explain Decision Making and Looping in Java.
- b) Explain Android OS Architecture.
- c) Explain User Interface Components in Android.
- d) Explain Java Strings and Collections

**Q.4 Answer the following. (Any Two) 12**

- a) Explain Activity States with diagram.
- b) Explain Fragment Transactions. (Add, Remove, Replace).
- c) Explain Java I/O Handling.

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

- a) Explain Passing Data using Intents.
- b) Explain Broadcast Receivers in Android.
- c) Explain Error and Exception Handling in Java.