

Seat No.	
-------------	--

**M.Sc. (Semester - I) (New) (NEP CBCS) Examination: Oct/Nov-2023
ELECTRONICS (IOT)**

Hardware, Programming and IDE tools- AVR & PIC Series (2315101)

Day & Date: Friday, 05-01-2024

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) The number of general-purpose working registers in ATmega32 series are _____.

a) 8	b) 16
c) 24	d) 32
- 2) The EEPROM data memory size in ATmega328 is _____.

a) 1 KByte	b) 2 KByte
c) 3 KByte	d) 4 KByte
- 3) The IDE tool used for programming AVR microcontroller is _____.

a) Microchip Studio	b) ATMEL Studio
c) both a & b	d) MPLAB
- 4) The header file required to include time-delay library function for ATmega32 series is _____.

a) avr/io.h	b) util/delay.h
c) delay.h	d) delay_ms.h
- 5) 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
- 6) The data direction control register for I/O ports of PIC16C5x μ -controller series is _____.

a) TRISx	b) PORTx
c) OPTION	d) FSR
- 7) The IDE tool used for PIC μ -controller series is _____.

a) MPLAB	b) Microchip Studio
c) ATMEL Studio	d) Keil μ -Vision

- 8) The MPLAB IDE tool supports _____.
a) Assembler b) C compiler
c) simulator d) all of these

B) Fill in the blanks OR write true/false.

04

- 1) ATMEGA328 has 2 KBytes of internal SRAM. (true/false)
- 2) The control register to configure the bits of Timer-0 or Watch Dog Timer in PIC16C5x series is named as _____.
- 3) The 16-bit X register in ATmega32 series consists of two 8-bit general purpose registers _____ & _____ merged together.
- 4) The File Select Register (FSR) is an indirect data memory address pointer. (true/false)

Q.2 Answer the following. (any Six two mark each)

12

- a) Draw the bit-wise structure of AVR series Status register.
- b) List the device clocking options for ATmega32 series.
- c) Write a C language instruction to configure PORT-B as an input port for ATmega32.
- d) Write a C language instruction to configure only Bit-5 of DDRC register as output bit without affecting other bits.
- e) Draw the external brown-out protection circuit for PIC 16C5x series.
- f) List any four control registers in the register file map of PIC16C5x series.
- g) Draw the bit assignment for OPTION register in PIC16C5x series.
- h) Write a C language instruction to configure PORT-B as an output port for PIC16C5x series.

Q.3 Answer the following. (any three - four marks each)

12

- a) Draw the simplified view of AVR ATmega32 series microcontroller.
- b) Write a short note on clock sources of PIC16C5x series microcontroller.
- c) Draw Timer-0 normal mode block diagram for ATmega32 series microcontroller.
- d) Write a note on Power-on-Reset (POR) in PIC16C5x series.

Q.4 Answer the following. (Any two – six marks each)

12

- a) Explain the 28-pin distribution of ATmega328 microcontroller.
- b) Discuss the architectural block diagram of PIC16C5x series microcontroller.
- c) Write a note on IDE tool ATMEL or Microchip Studio for AVR ATmega 32 series.

Q.5 Answer the following. (Any two – six marks each)**12**

- a)** Assuming a crystal frequency of 8 MHz, write a C program to generate a square wave of frequency 5 KHz on port pin PB-2 without pre-scalar option for ATmega32 series.
- b)** Explain AVR ATmega32 Timer-1 view in detail.
- c)** Assuming a crystal frequency of 20 MHz, write a C program to serially send the ASCII data string “All is Well” to PC at a standard baud rate of 9600 for PIC16C5x series.

Seat No.	
----------	--

M.Sc. (Semester - I) (New) (NEP CBCS) Examination: Oct/Nov-2023
ELECTRONICS (IOT)
Sensors and Actuators (2315102)

Day & Date: Sunday, 07-01-2024
 Time: 03:00 PM To 05:30 PM

Max. Marks: 60

- Instructions:** 1) All question are compulsory.
 2) Draw neat diagram and write equations wherever necessary.
 3) Figure to right indicate full marks.
 4) Use of log table and calculator is allowed.
 5) Use of Mobile is strictly prohibited.

Q.1 A) Choose correct alternative.

08

- 1) A device that converts one form of energy into other form of energy is called _____.
 - a) Transmitters
 - b) Transducers
 - c) Receivers
 - d) None of the above
- 2) What is PTC thermistor?
 - a) Positive temperature coefficient thermistor
 - b) Positive transient coefficient thermistor
 - c) Pulse transmit coefficient thermistor
 - d) All the above
- 3) Strain gauge is a _____ device that converts _____ into _____.
 - a) Active; electrical signal; change of resistance
 - b) Passive; electrical signal; change of resistance
 - c) Active; mechanical displacement; change of resistance
 - d) Passive; mechanical motion; change of resistance
- 4) In a LVDT, the two secondary voltages _____.
 - a) Are independent of the core position
 - b) Vary unequally depending on the core position
 - c) Vary equally depending on the core position
 - d) Are always in phase quadrature
- 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) Capacitance of a parallel plate capacitor is given as _____.
 - a) $C = A \epsilon / d$
 - b) $C = \epsilon / d$
 - c) $C = A / d$
 - d) $C = A$
- 7) Rotor resistance speed control method is not applicable in _____.
 - a) Slip Ring induction motor
 - b) Squirrel cage induction motor
 - c) Synchronous motor
 - d) None of the above

- 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 True/False. 04

- 1) Ability of the sensor to reproduce consistent readings is called _____.
- 2) Direction of rotation of DC motor is determined by _____.
- 3) Inverse piezoelectric effect converts electrical energy into _____ energy.
- 4) Silicon is the most abundant and easily available sensing material.
(True/False)

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

- a) List any two inductive sensors.
- b) Define Accuracy and Precision.
- c) What is gauge factor?
- d) Give the principle of operation of LVDT.
- e) Define actuator.
- f) Mention any four applications of bio sensors.
- g) Differentiate sensors and transducers.
- h) Give the principle capacitive sensors.

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

- a) Give the classification of sensors.
- b) Explain in brief electroplating.
- c) Discuss the working principle and operation of Capacitor pressure sensor.
- d) Explain any four static or dynamic characteristics of sensors.

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

- a) Discuss any two types of microsensors.
- b) Discuss Construction, characteristics and application of Resistance Hygrometer.
- c) Discuss any two sensor material processing techniques.

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

- a) Describe the construction of Potentiometer transducer and explain its principle of operation with the aid of diagram. List the advantages, disadvantages and applications of Potentiometer Transducers.
- b) 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.
- c) Explain the Construction and working of Stepper Motor.

Seat No.	
-------------	--

M.Sc. (Semester - I) (New) (NEP CBCS) Examination: Oct/Nov-2023
ELECTRONICS (IOT)
Programming with C and C++ (2315107)

Day & Date: Tuesday, 09-01-2024
 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-table and calculator is allowed.
 - 5) Use of Mobile is strictly prohibited.

Q.1 A) Choose the correct alternatives.

08

- 1) 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;
- 2) What is the result of the expression '5 + 3 * 2' in C?

a) 16	b) 11
c) 13	d) 26
- 3) Which escape sequence is used to represent a new line in C?

a) \n	b) \t
c) \r	d) \a
- 4) What is the correct syntax for a single-line comment in C++?

a) // This is a comment	b) /* This is a comment */
c) -- This is a comment	d) # This is a comment #
- 5) Which keyword is used to define a class in C++?

a) Class	b) Type
c) Struct	d) define
- 6) Which operator is used to access the member of a class through a pointer in C++?

a) ::	b) ->
c) .	d) *
- 7) What does the 'virtual' keyword indicate in C++?
 - a) The variable is dynamically allocated
 - b) The function can be overridden in derived classes
 - c) The variable cannot be modified
 - d) The function is static
- 8) Which of the following is not a storage class specifier in C++?

a) Static	b) Dynamic
c) Auto	d) register

- B) Write True or False.** **06**
- 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) strcmp' function Compares two strings in C.
 - 4) static' keyword in C Preserves the value of a variable between function calls.
- 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) What is the difference between C and C++ programming languages?
 - f) Explain the significance of the class keyword in C++.
 - g) Differentiate between a class and an object in C++.
 - h) Explain the difference between public, private, and protected access specifiers 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) Describe the role of the preprocessor directives in C++. Provide an example illustrating the use of #define and #include.
 - d) Define the terms "class" and "object" in C++. Provide an example illustrating the creation of a class and an object.
- 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) Discuss the importance of constructors and destructors in C++ classes. Provide examples of when and how they are used in object-oriented programming.
 - c) Compare and contrast pass-by-value and pass-by-reference in C++ functions. Provide examples to demonstrate the differences and advantages of each.
- Q.5 Answer the following. (Any Two)** **12**
- a) Discuss the use of file handling in C++. Provide examples illustrating how to read from and write to files using both text and binary modes.
 - b) Describe the role of bitwise operators in C. Provide examples illustrating the use of bitwise AND, OR, XOR, left shift, and right shift operations.
 - c) Discuss the importance of the 'const' keyword in C. Provide examples demonstrating its use in variable declarations, function parameters, and pointers

Seat No.	
----------	--

M.Sc. (Semester - I) (New) (NEP CBCS) Examination: Oct/Nov-2023
ELECTRONICS (IOT)
Research Methodology (2315103)

Day & Date: Thursday, 11-01-2024
 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) Which of the following is a non-probability sampling method?
 - a) Simple random sampling
 - b) Stratified sampling
 - c) Convenience sampling
 - d) Systematic sampling
- 2) What is the primary role of an operational definition in research?
 - a) To describe research participants
 - b) To define research variables in measurable terms
 - c) To provide a theoretical framework
 - d) To conduct statistical analyses
- 3) Which of the following is an example of a qualitative research method?
 - a) Survey
 - b) Case study
 - c) Experiment
 - d) Observational study
- 4) In an experiment, what is the purpose of a control group?
 - a) To manipulate the independent variable
 - b) To receive the experimental treatment
 - c) To establish a baseline for comparison
 - d) To eliminate confounding variables
- 5) What is the primary purpose of using thematic analysis in qualitative research?
 - a) To identify patterns or themes in data
 - b) To conduct statistical tests
 - c) To establish causation
 - d) To calculate effect sizes
- 6) Which of the following is an example of a primary data source?
 - a) Textbook
 - b) Journal article
 - c) Survey responses
 - d) Literature review
- 7) What is the purpose of a research hypothesis?
 - a) To summarize existing literature
 - b) To guide the entire research process
 - c) To collect primary data
 - d) To conduct statistical analyses

- 8) Which of the following is a quantitative research method?
- a) Case study
 - b) Grounded theory
 - c) Survey
 - d) Ethnography

B) State true or false. 04

- 1) Correlation implies causation; if two variables are correlated, one must cause the other.
- 2) Cross-sectional studies involve the collection of data at a single point in time.
- 3) The purpose of a literature review is to summarize and synthesize existing research on a particular topic.
- 4) In experimental research, the independent variable is manipulated to observe its effect on the dependent variable.

Q.2 Answer the following (Any Six) 12

- a) Differentiate between a research question and a hypothesis.
- b) Explain the concept of purposive sampling.
- c) Define internal validity in a research study.
- d) What is the purpose of a correlation study in research?
- e) Explain the importance of random assignment in experimental research.
- f) Define the term "case study" in qualitative research.
- g) Discuss the difference between primary and secondary data.
- h) Why is it essential to establish the reliability of a measurement instrument?

Q.3 Answer the following (Any Three) 12

- a) Define research methodology and explain its significance in the research process.
- b) Discuss the difference between qualitative and quantitative research methods. Provide examples of when each approach is appropriate.
- c) Describe the role of research design in the research process. Provide examples of different research designs and when they are appropriate.
- d) Discuss the significance of data collection methods in research. Provide examples of qualitative and quantitative data collection techniques.

Q.4 Answer the following (Any Two) 12

- a) Discuss the role of a research problem statement in shaping the entire research process. Provide examples of well-defined research problems.
- b) Explain the concept of a sampling frame and its importance in sampling procedures. Provide examples illustrating the use of sampling frames in research.
- c) Compare and contrast probability and non-probability sampling methods. Provide examples of situations where each type of sampling is appropriate.

Q.5 Answer the following (Any Two) 12

- a) Explain the concept of a research instrument and discuss the differences between closed-ended and open-ended questions. Provide examples of when each type of question is appropriate.
- b) Compare and contrast nominal, ordinal, interval, and ratio scales of measurement. Provide examples of research situations where each scale is suitable.
- c) Explain the concept of statistical significance in quantitative research. Provide examples illustrating how researchers interpret statistical significance.