Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: March/April – 2026
Electronic System Design (2320101)

Day & Date: Friday, 17-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

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

1) A load cell typically measures _____.
   a) Temperature b) Force
   c) Humidity d) Light

2) LDR abbreviated as _____.
   a) Light Detected resistor
   b) Luminance Dependent resistor
   c) Light Determinant resistor
   d) Light Dependent resistor

3) RTD sensors are usually made from _____.
   a) Nickel b) Copper
   c) Platinum d) Silver

4) A Schmitt trigger converts a noisy analog signal into a _____.
   a) Sine wave b) Clean square wave
   c) Triangular wave d) Sawtooth wave

5) An operational amplifier is commonly used in _____.
   a) Power supplies b) Signal conditioning
   c) Frequency counters d) All of the above

6) The output of an astable multivibrator is _____.
   a) DC b) Pulsating DC
   c) Square wave d) Sine wave

7) The voltage regulation of a Zener diode depends on its _____.
   a) Capacitance b) Reverse breakdown voltage
   c) Forward voltage drop d) Frequency response

8) The typical voltage output of a thermocouple is measured in _____.
   a) Millivolts b) Amperes
   c) Kilovolts d) Microamps

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

1) An LVDT is used to measure _____.
2) A 555 timer can operate in monostable and _____ modes.
3) Capacitive sensors work based on the change in _____.
4) Thermistors have a _____ temperature coefficient.

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

a) What is the various types of temperature sensor? Explain one in detail.
b) Write a short note on LVDT.
c) Define the term “frequency synthesizer” and its applications.
d) How does a Schmitt trigger help stabilize digital circuits?
e) What are the advantages of using a load cell in force measurement?
f) How is a triangular waveform generated using op-amps.
g) What is the NEED of signal conditioning in instrumentation?
h) Explain the difference between an astable and monostable multivibrator.

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

a) Design a monostable mv using IC 555.
b) With neat diagram explain transistor series regulator.
c) Explain the design of a 16-to-1 multiplexer using 4-to-1 MUXs.
d) With neat diagram explain transistor shunt regulator.

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

a) Explain the working principle and design of an RTD.
b) Design an oscillator circuit using a Schmitt trigger.
c) Design a monostable mv using IC 741.

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

a) Explain working principle of thermocouple and RTD.
b) Design a Astable mv using IC 555.
c) Describe the design of a triangular waveform generator using an op-amp.

Seat No.	

Set | **P**

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: March/April – 2026
Microcontroller & Interfacing (2320102)

Day & Date: Monday, 20-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Choose correct alternatives: 08

1) The oscillator frequency of PIC16F877A is usually provided to which block first?
   a) I/O Ports b) CPU core
   c) ADC d) Timers

2) Which register in AVR32 holds the flags like zero and carry?
   a) GPR b) SREG
   c) SP d) PC

3) MPLAB X IDE is developed by: _____.
   a) Intel b) Microchip
   c) Atmel d) Tl

4) Which PIC peripheral is commonly used for serial communication?
   a) CCP b) ADC
   c) UART d) PWM

5) Which sensor output typically requires an instrumentation amplifier before ADC?
   a) LDR b) Thermocouple with AD595
   c) Push-button d) LED

6) In AVR fast PWM mode, increasing prescaler will: _____.
   a) Increase PWM frequency b) Decrease PWM frequency
   c) No change d) Disable PWM

7) Which instruction type changes the program counter directly?
   a) Arithmetic b) Branch/Jump
   c) Logical d) Bit test

8) PIC special function registers (SFRs) are mapped to: _____.
   a) External memory b) I/O space
   c) Program memory d) EEPROM

B) Fill in the blanks OR write true/false. **04**

1) The PIC16F877A has _____ number of I/O ports.
2) True / False: ADC result in PIC16F877A is left-justified when ADRESH holds the most significant bits.
3) AVR32's stack pointer is used primarily to store _____ during interrupts.
4) True / False: MPLAB X supports both simulator and hardware debugging.

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

a) List two reset options available in PIC16F877A.
b) Define SFR with one example in PIC family.
c) What is the role of the Program Counter (PC) in microcontrollers?
d) Mention two components of MPLAB-X IDE used during code development.
e) Give two applications of PWM in embedded systems.
f) State two differences between UART and SPI.
g) Name two sensors from the syllabus and the physical quantity they measure.
h) What is the function of Capture-Compare module in PIC?

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

a) Explain oscillator and clocking options of PIC16F877A with a neat diagram.
b) Describe the architecture and key features of AVR32 microcontroller.
c) Explain how ADC is configured in PIC16F877A and how to read a 10-bit result.
d) Explain the working principle of an LM35 temperature sensor and how to interface with PIC ADC.

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

a) Write an Embedded C program (with brief explanation) to initialize UART on PIC16F877A for 9600 bps and send a string "HELLO".
b) Design an interfacing circuit and explain connections to interface a 16×2 LCD in 4-bit mode with PIC16F877A.
c) Explain timer configuration and usage for generating 1 ms interrupts using AVR32 or PIC (show calculations).

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

a) A temperature control system uses LM35 and a relay to switch a heater. Draw the block diagram, explain sensor conditioning, ADC conversion and relay control logic. (Use PIC)
b) Write an algorithm and flowchart for scanning a 4x4 matrix keypad and debounce handling; explain how to read a pressed key using AVR/PIC.
c) Explain interfacing and control of a DC motor using PWM and an H-bridge driver; include duty cycle calculations to achieve variable speed.

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Set P

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS) Examination: March/April - 2026
Digital Electronics and Verilog HDL (2320108)

Day & Date: Wednesday, 22-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Select the correct answer. **08**

1) A 4-to-1 multiplexer has how many select lines?
   a) 1 b) 2
   c) 3 d) 4

2) Which flip-flop is level sensitive and has direct asynchronous set and reset inputs commonly denoted as S and R?
   a) D-FF b) JK-FF
   c) SR-Latch d) T-FF

3) In Verilog, which keyword is used to define a module?
   a) design b) Module
   c) entity d) Block

4) A carry look-ahead adder improves performance by reducing which of the following?
   a) Propagation delay b) Power consumption
   c) Gate count d) Area

5) Which device is classified as a complex programmable logic device?
   a) PROM b) PAL
   c) CPLD d) ROM

6) In a Johnson counter of length n, the sequence length (number of unique states) is _____.
   a) n b) 2^n
   c) 2n d) n-1

7) For unsigned binary division, the hardware operation primarily uses which of the following?
   a) Shifts and subtraction b) Multiplication and add
   c) XOR operations d) Lookup table

8) In Verilog, the blocking assignment operator is _____.
   a) <= b) =
   c) -> d) :=

B) State True or False. **04**

1) A D flip-flop has two stable states.
2) In a Moore machine, outputs depend only on the current state.
3) The sensitivity list in Verilog is used only for sequential circuits.
4) A half-adder can perform both addition and subtraction.

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

a) Define half adder and give its truth table.
b) State the difference between synchronous and asynchronous counters (two points).
c) What is a PLA and how does it differ from PAL? (brief)
d) List two advantages of using CPLD/FPGA over discrete ICs.
e) What are tasks and functions in Verilog — one key difference?
f) Write the Boolean expression and minimal implementation idea for a 4-input parity generator (odd parity).
g) What is state assignment in FSM design and why is it important?
h) Define a bi-directional shift register in one sentence.

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

a) What is the difference between Multiplexer and Demultiplexer.
b) Write a short note on PAL.
c) Draw and explain the operation of a Johnson counter with 4 stages and show its state sequence.
d) Write a Verilog code to implement a 4x1 multiplexer using always block.

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

a) Explain Simple PLD in detail.
b) Explain Operators in Verilog HDL.
c) Design a synchronous up/down counter (mod-10) using JK flip-flops. Provide state diagram and excitation for JK inputs.

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

a) Write a Verilog module (structural or dataflow) for a 4-to-1 multiplexer with parameterized data width. Also provide a simple testbench outline.
b) Design Octal to Binary encoder.
c) Discuss the applications and design principles of FPGA in digital circuits.

Seat No.	

Set **P**

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: March/April - 2026
Research Methodology (2320103)

Day & Date: Monday, 27-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

Q.1 A) Select the correct answer. **08**

1) _____ of the following is NOT a primary source for literature review.
   a) Patents b) Monographs
   c) Review articles d) Laboratory notebook

2) A hypothesis that can be tested and refuted is called _____.
   a) Null hypothesis b) Working hypothesis
   c) Directional hypothesis d) Exploratory hypothesis

3) In experimental research, 'precision' primarily refers to _____.
   a) Closeness to true value
   b) Reproducibility of measurements
   c) Speed of experiment
   d) Sample size

4) _____ sampling method ensures every member of population has known non-zero probability of selection.
   a) Purposive sampling b) Snowball sampling
   c) Probability sampling d) Convenience sampling

5) Error due to systematic bias in measurement instruments is called _____.
   a) Random error b) Gross error
   c) Systematic error d) Sampling error

6) Which software is commonly used for reference management in research writing?
   a) MATLAB b) EndNote
   c) SPSS d) Origin

7) A critical literature review primarily aims to _____.
   a) Compile all existing papers
   b) Identify gaps and evaluate methodologies
   c) Provide only historical facts
   d) List references alphabetically

8) _____ microscopy technique is best suited for imaging surface topography at nanometre resolution.
   a) Optical microscopy
   b) Scanning Electron Microscopy (SEM)
   c) Transmission Electron Microscopy (TEM)
   d) Atomic Force Microscopy (AFM)

B) State True or False. **04**

1) Pie chart is useful for comparing values over categories.
2) A review article is considered a secondary source.
3) Sampling error generally decreases as sample size increases.
4) A complete list of all the sampling units is called sample design.

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

a) Define 'research design' and list its main types.
b) What is the importance of a research proposal?
c) What are the characteristics of research?
d) What do you mean by Hypothesis?
e) Define Variable.
f) Briefly explain 'primary' and 'secondary' sources with examples.
g) What are different types of Graphs?
h) State two advantages of probability sampling.

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

a) Write objectives of research.
b) Explain the steps involved in selecting and formulating a research problem for electronics science.
c) Write a note on Qualitative Data Analysis.
d) Explain precision and accuracy with suitable examples from electronics experiments.

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

a) Explain types of research.
b) Explain data processing strategies and tools for analyzing experimental data in electronics research.
c) Explain criteria for selection of research problem.

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

a) Write a brief note on patents and their importance in scientific research.
b) Explain the steps involved in writing report in detail.
c) What are the various types of sample design?

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Set P

M.Sc. (Electronics Science) (Semester - II) (New) (NEP CBCS)
Examination: March/April- 2026
Control System (2320201)

Day & Date: Thursday, 16-04-2026 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.
3) Use of non-programmable calculator is allowed.

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

1) Transfer function of the system is defined as the ratio of Laplace output to Laplace input considering initial conditions _____.
   a) 1 b) 2
   c) 0 d) infinite

2) The transfer function is defined as a ratio of _____.
   a) Laplace transform of output to Laplace transform of the input
   b) Laplace transform of output + Laplace transform of the input
   c) Laplace transform of output - Laplace transform of the input
   d) None of the above

3) Routh Hurwitz criterion gives _____.
   a) Number of roots in the right half of the s-plane
   b) Value of the roots
   c) Number of roots in the left half of the s-plane
   d) Number of roots in the top half of the s-plane

4) Scientist Nyquist have contribution in _____.
   a) Asymptotic plots d) Polar plots
   c) Root locus technique d) Constant M and n circle

5) What is the purpose of a Bode plot in control system analysis?
   a) To determine the system's time response
   b) To analyse the system's frequency response
   c) To visualize the system's pole-zero locations
   d) To calculate the system's gain margin

6) What is the main advantage of closed-loop control systems over open-loop systems?
   a) Greater simplicity b) Better accuracy and stability
   c) Lower cost d) Faster response time

7) _____ converts the angular position of the shaft into electrical signal.
   a) DC Servomotor b) AC Servomotor
   c) Tacho generator d) Synchro

8) In time domain analysis response of the system varies w.r.t _____.
   a) Time
   b) Frequency
   c) Both time and frequency
   d) Constant

B) Fill in the blanks OR write True/False. **04**

1) Feedback control systems are referred to as closed loop systems.
2) The Root locus is a time domain approach.
3) If the roots of characteristic equation lie on imaginary axis the system is unstable.
4) The input node is a node that contains only outgoing branches.

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

a) Define open loop and closed loop systems.
b) What are the basic components of a signal flow graph?
c) What is Hurwitz criterion?
d) What is lag compensator.
e) List the time domain specifications?
f) What is ON-OFF controller?
g) What is the necessary condition for stability?
h) What are the components of control system?

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

a) Define Laplace transforms. What is the Laplace transform of standard test signal?
b) What are the effects adding open loop poles and zero on the nature of root locus and on system?
c) Describe briefly potentiometer with its block diagram form.
d) State and explain the effects of Proportional Controller on the system dynamics.

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

a) Give the block diagram reduction rules to find the transfer function of the system.

b) With the help of Routh's stability criterion find the stability of the following systems represented by the characteristic equations:

$$s^4 + 8s^3 + 18s^2 + 16s + 5 = 0$$

c) Find the gain of the system represented by the following equations.

$$x_2 = a_{22}\, x_1 + a_{32}\, x_3$$
$$x_3 = a_{23}\, x_2 + a_{34}\, x_4$$
$$x_4 = a_{24}\, x_2 + a_{34}\, x_3 + a_{44}\, x_4$$
$$x_5 = a_{25}\, x_2 + a_{45}\, x_4$$

Here, the input node is x_1 and output node is x_5

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

a) What is tachogenerator? Draw and explain the working of DC tachogenerator and represent in block diagram form.

b) Obtain gain margin for the open loop transfer function using Bode plot.

$$G(s).H(s) = 80/s\,(1 + s/50)\,(1 + s/20)$$

c) Explain state model from transfer function using direct method.

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Set **P**

M.Sc. (Electronics Science) (Semester - II) (New) (NEP CBCS)
Examination: March/April - 2026
Mechatronics (2320202)

Day & Date: Saturday, 18-04-2026 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

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

Q.1 A) Select the correct answer. **08**

1) _____ of the following uses compressed air to operate.
   a) Hydraulic actuator b) Pneumatic actuator
   c) Electrical actuator d) Mechanical actuator

2) _____ component is commonly used in mechanical actuation systems.
   a) Solenoid b) Gear
   c) Motor d) Cylinder

3) _____ is used to convert AC to DC.
   a) Inverter b) Rectifier
   c) Filter d) Transformer

4) _____ motor is known for precise angular movement control.
   a) Induction motor b) BLDC motor
   c) Stepper motor d) Universal motor

5) A humanoid robot is an example of _____.
   a) Artificial intelligence
   b) Stand-alone systems
   c) Large factory systems
   d) High level distributed sensor microcontroller actuator

6) _____ is the feedback generated by sensors in a mechatronics system given.
   a) Input sensors b) Comparators
   c) Mechanical actuators d) Output sensors

7) _____ is the first aspect which needs to be considered in the Mechatronics design process.
   a) Hardware integration and simulation
   b) Conceptual design
   c) Mathematical modelling
   d) Modeling and simulation

8) In the level of integration of Mechatronics system, an example of the first level is _____.
   a) Fluid valves
   b) Automatic machine tools
   c) Industrial robots
   d) Microprocessors

B) State True or False. **04**

1) Hydraulic systems use air as the working fluid.
2) Infrared sensors can be used for motion detection.
3) AC motors cannot be used with VFDs.
4) Gears can change the torque and speed in mechanical systems.

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

a) What is the function of a digital signal in mechatronics?
b) Mention any two digital logic gates and their functions.
c) What is the purpose of a stepper motor?
d) Define a positional sensor.
e) What is the function of a variable frequency drive?
f) What is the role of an IR (infrared) sensor?
g) Give two examples of electrical actuation.
h) What is the use of a rotary encoder?

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

a) Explain the mechatronic design process with a block diagram.
b) Describe the working of a hydraulic actuation system.
c) Compare AC and DC motors.
d) Explain the role of gears and levers in mechanical systems.

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

a) Explain Hydraulic actuation system.
b) Explain BLDC motor & servo motor.
c) Explain mechatronics system 1) Digital Camera.

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

a) Explain Mechanical actuation system.
b) Explain Linkages, Screw & Fastener.
c) Explain mechatronics system 1) Microwave oven

SLR-PH-10

Seat No.	

Set | **P**

M.Sc. (Electronics Science) (Semester - II) (New) (NEP CBCS)
Examination: March/April - 2026
Advanced Microcontrollers and protocols (2320208)

Day & Date: Tuesday, 21-04-2026 Max. Marks: 60
Time: 11:00 AM To 01:30 PM

Instructions: 1) Figures to the right indicate full marks.

Q.1 A) Select the correct answers: **08**

1) ARM architecture is based on ____.
   a) CISC b) RISC
   c) VLIW d) DSP

2) Thumb instruction set is ____.
   a) 32-bit b) 16-bit
   c) 64-bit d) 8-bit

3) Which register holds flags in ARM?
   a) PC b) SP
   c) CPSR d) LR

4) I2C uses how many lines?
   a) 1 b) 2
   c) 3 c) 4

5) SPI is ____.
   a) Asynchronous b) Parallel
   c) Synchronous d) Serial async

6) CAN protocol is used in ____.
   a) Audio systems b) Automobiles
   c) Televisions d) Printers

7) Cortex-M series is used for ____.
   a) High-end PCs b) Embedded systems
   c) Servers d) GPUs

8) ACK in I2C stands for ____.
   a) Acknowledge b) Access
   c) Address d) Align

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

1) ARM7 uses _____ architecture.
2) SPI has _____ lines for communication.
3) CAN stands for _____.
4) Interrupt vector table stores _____.

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

a) Define ARM architecture.
b) Explain processor modes in ARM.
c) What is pipeline in ARM?
d) Define interrupt.
e) Explain ACK and NACK in I2C.
f) List SPI pins.
g) Define CAN bus.
h) What is memory mapped I/O.

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

a) Explain ARM programmer's model.
b) Processor vs Microcontroller.
c) Thumb instruction set.
d) Explain ARM registers.

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

a) Explain I2C protocol with diagram.
b) Explain SPI communication with timing.
c) Explain Keil IDE.

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

a) Explain CAN protocol and frame format.
b) Write Embedded C program for LED interfacing in ARM.
c) Explain ARM memory organization.

SLR-PH-12

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Set P

M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Internet of Things (2320301)

Day & Date: Friday, 17-04-2026 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) Select correct alternative. **08**

1) _____ protocol is designed for constrained RESTful devices in IoT.
   a) CoAP b) SMTP
   c) FTP d) SNMP

2) _____ wireless option is best for long-range, low-power IoT WANs.
   a) ZigBee b) LoRaWAN
   c) NFC d) Ethernet

3) _____ is the component of an IoT system that executes a program.
   a) A sensor b) A microcontroller
   c) An actuator d) ADC converter

4) _____ one is NOT a feature of Raspberry Pi 4 compared to older models.
   a) Multiple USB 3.0 ports
   b) Improved GPU
   c) On-board ADC
   d) Up to 8GB RAM option

5) An IoT network is a collection of _____ devices.
   a) Signal b) Machine to Machine
   c) Interconnected d) Network to Network

6) _____ of the following can not be considered an IoT device.
   a) Smart watch b) Android Phone
   c) Laptop d) Tube light

7) _____ of these IoT services is primarily used for rapid mobile app dashboards and IoT control.
   a) Blynk b) FTP
   c) SMTP d) Telnet

8) IoT is based on _____ technology.
   a) Hardware b) Software
   c) None d) Both of these

B) State True or False. **04**

1) The role of Cloud in smart grid architecture of IoT is to manage data.
2) Raspberry Pi has built-in analog-to-digital converters.
3) UAVs can extend coverage for sensor networks in inaccessible areas.
4) Low Protocol Wide Area Network is the full form of the LPWAN?

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

a) Explain characteristics of IoT?
b) What is features of UAV network?
c) List three connectivity technologies used in IoT and one use case each.
d) What are the features of Raspberry Pi?
e) Give two industrial IoT (IIoT) applications.
f) Write application of Wireless sensor network (WSN).
g) What are the different variants of Raspberry Pi?
h) What is a broker in MQTT?

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

a) Explain message QoS levels in MQTT and their significance.
b) Discuss challenges in scalability of IoT systems.
c) Explain advantages & disadvantages of IoT?
d) What are the differences between IoT and M2M?

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

a) What is actuator? Explain need, classification & applications of actuator.
b) Propose an architecture for smart irrigation system using MQTT and list sensors/actuators required.
c) Explain IoT architecture in detail.

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

a) Explain cloud computing in detail?
b) Explain any one of the Health IoT system implementation in detail.
c) Explain steps how LED interface with Raspberry Pi?

Seat No.	

Set | P

M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Advance Embedded System (2320302)

Day & Date: Monday, 20-04-2026 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) Embedded systems are typically characterized by _____.
a) General purpose OS b) Real-time constraints
c) High user interaction d) Heavy UI frameworks

2) The Thumb instruction set in ARM processors is _____.
a) 32-bit only b) 64-bit only
c) 16/32-bit compressed form d) For GPUs

3) UART communication is _____.
a) Serial synchronous b) Serial asynchronous
c) Parallel d) Optical

4) I^2C uses _____.
a) One wire b) Two wires (SDA/SCL)
c) Three wires d) Four wires

5) A watchdog timer (WDT) is used to _____.
a) Increase CPU speed
b) Detect and recover from software hangs
c) Manage memory
d) Provide audio output

6) In memory-mapped I/O, peripherals are _____.
a) Accessed via special I/O instructions only
b) Mapped into the same address space as memory
c) Not accessible by CPU
d) Accessed only via DMA

7) Semaphore in RTOS is used for: _____.
a) File storage
b) Task synchronization and resource protection
c) Display control
d) PWM generation

8) LPC2148 is based on which ARM core?
a) ARM7TDMI b) Cortex-M3
c) Cortex-A8 d) ARM9

B) Fill in the blanks OR write true/false **04**

1) SPI stands for _____.
2) PWM stands for _____.
3) True/False: CAN is typically used in automotive networks.
4) True/False: An ISR should generally perform long blocking operations.

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

a) Define an embedded system and give two application areas.
b) What is memory-mapped I/O?
c) Give two features of LPC2148 microcontroller.
d) Mention two advantages of using RTOS over a bare-metal loop.
e) What is SPI and name its main signals.
f) What is a hardware interrupt and one example peripheral that uses it?
g) Define watchdog timer in one sentence.
h) What is the role of PLL in microcontrollers?

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

a) Explain the basic ARM pipeline stages and how pipelining improves performance.
b) Describe memory types used in embedded systems.
c) Explain interrupt vector table and how an ISR is invoked.
d) Describe PWM operation and one application in embedded systems.

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

a) Draw and describe a simple RTOS kernel architecture.
b) Explain UART frame format and one method to handle overrun/ framing errors in software.
c) For a digital camera embedded system, list major embedded components and briefly describe their functions.

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

a) Compare I^2C and SPI in 6 points.
b) Explain DMA (Direct Memory Access) and its advantages in embedded systems.
c) Describe USB device mode briefly and one embedded use-case.

Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: March/April – 2026
Optical Fiber Communication (2320306)

Day & Date: Wednesday, 22-04-2026 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) The single-mode operation of a fiber is typically achieved when the V-number is _____.
   a) > 2.405 b) < 2.405
   c) = 0 d) = 10

2) Rayleigh scattering loss in optical fiber is inversely proportional to _____.
   a) wavelength^4 b) wavelength
   c) wavelength^2 d) log(wavelength)

3) A graded-index multimode fiber reduces modal dispersion by _____.
   a) Increasing core diameter
   b) Introducing parabolic refractive index profile
   c) Using multimode LEDs
   d) Using connectors

4) The device used to combine two wavelengths into one fiber is called ____.
   a) Splitter b) Coupler
   b) Multiplexer d) Isolator

5) Avalanche photodiode (APD) advantage over PIN includes _____.
   a) Lower dark current b) Higher sensitivity due to gain
   b) No need for bias d) Lower cost

6) The dispersion parameter D(ps/(nm.km)) is related to group delay $\beta 1$ and $\beta 2$ as: _____.
   a) $D = -(\lambda/c)d^2\, n/d\lambda^2$ b) $D = (2\pi c/\lambda^2)\beta 2$
   c) $D = -(\lambda/c)d^2\beta/d\lambda^2$ d) None of the above

7) Fiber couplers that split power unequally are called _____.
   a) Symmetric couplers b) Directional couplers
   c) Tapers d) Unequal split couplers

8) Modal cut-off for single-mode fiber depends on _____.
   a) Core radius and wavelength b) Cladding elasticity
   c) Connector polish d) Ambient temperature

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

1) The V-number (normalized frequency) of a fiber is given by $V = (2\pi a/\lambda)$ _____.
2) Fresnel reflection occurs at a fiber end-face when there is a change in _____.
3) Optical amplifiers (e.g., EDFA) operate typically in the _____ wavelength band (~1550 nm).
4) In single-mode fiber, only the _____ mode propagates above cut-off.

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

a) Define numerical aperture and explain its physical meaning in one sentence.
b) State two advantages of single-mode fibers over multimode fibers.
c) What is Rayleigh scattering and why is it important at optical wavelengths?
d) Give two commonly used methods to couple laser light into a fiber and mention coupling loss factors.
e) Define responsivity of a photodiode and state typical units.
f) Briefly describe what is meant by chromatic dispersion slope.
g) List two applications of optical couplers/splitters in networks.
h) What safety class is typical for fiber optic systems (laser safety) and why?

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

a) Explain derivation of cutoff wavelength for single-mode step-index fiber and mention the value of V for single-mode.
b) Describe the structure and working of an LED used as optical source, with emphasis on spontaneous emission.
c) Explain the principle and basic setup of OTDR measurement and how event loss is identified.
d) Discuss waveguide dispersion and how changing core/cladding dimensions affects it.

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

a) Explain in detail the noise sources in optical receivers and how they affect sensitivity.
b) Discuss WDM system components and how they enable high-capacity transmission.
c) Explain methods to reduce dispersion in long-haul optical communication systems.

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

a) Design considerations for fiber optic links in access networks (last mile): list and explain.
b) Explain BPSK and QPSK modulation formats and compare spectral efficiency.
c) Describe fiber alignment and joint loss factors; how are mechanical alignment and precision affecting loss?

Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - IV) (New) (NEP CBCS)
Examination: March/April – 2026
PLC and SCADA (2320401)

Day & Date: Thursday,16-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

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

1) RS-485 allows _____ communication.
   a) Serial multi-point b) Parallel
   c) Optical d) None

2) HART protocol is used in _____ instrumentation.
   a) Smart b) Mechanical
   c) Electrical d) Analog only

3) TCP works at _____ layer.
   a) Transport b) Network
   c) Physical d) Data link

4) PID full form is _____.
   a) Proportional Integral Derivative
   b) Process Input Device
   c) Power Input Device
   d) None

5) PLC uses _____ programming.
   a) Ladder b) Java
   c) Python d) HTML

6) SCADA is used for _____ control.
   a) Supervisory b) Manual
   c) Mechanical d) None

7) DCS stands for _____.
   a) Distributed Control System b) Digital Control System
   c) Data Control System d) None

8) Modbus is a _____ protocol.
   a) Communication b) Electrical
   c) Mechanical d) None

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

1) Closed loop system uses feedback.
2) PLC has input/output modules.
3) SCADA cannot monitor remotely.
4) CAN bus is high speed.

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

a) Define RS-485.
b) What is HART?
c) Define TCP/IP layers.
d) What is closed loop control?
e) Define ladder diagram.
f) What is MTU?
g) Define DCS.
h) What is PID?

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

a) Explain Modbus protocol.
b) Explain CAN bus.
c) Explain PLC timers and counters.
d) Explain RTU functions.

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

a) Explain PLC programming.
b) Explain SCADA communication.
c) Explain full state feedback.

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

a) Explain Internet layer protocols.
b) Explain control system categories.
c) Explain pole placement method.

Seat No.	

Set | P

M.Sc. (Electronics Science) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Integrated Circuits and VLSI (2320402)

Day & Date: Saturday, 18-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

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

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

1) Features of switch logic approach _____.
   a) occupies more area
   b) no undesirable threshold voltage
   c) low power dissipation
   d) all of the mentioned

2) When clock signal is active, parasitic capacitance will ____.
   a) discharge b) charge
   c) not charges d) random

3) In depletion mode pull-up, dissipation is high since current flows when?
   a) Vin = 1 b) Vin = 0
   c) Vout = 1 d) Vout = 0

4) Power dissipation in switch logic is ____.
   a) less b) more
   c) high d) very less

5) In which class does MOSFETs work as amplifier?
   a) Class-A b) Class-B
   c) Class-C d) Class-D

6) In CMOS logic circuit the p-MOS transistor acts as: ____.
   a) Pull down network b) Pull up network
   c) Load d) Short to ground

7) A typical quiescent power dissipated of low power CMOS is ____.
   a) 2 nW b) 5 nW
   c) 0.5 nW d) 30 nW

8) The access time of 256 MB CMOS DRAM is _____ nano seconds.
   a) 1 b) 10
   c) 4 d) 8

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

1) MOSFET can be fabricated on single CHIP.
2) Circuit design concepts can also be represented using a symbolic diagram.
3) If the drain, source, and channel of a MOSFET are all a ρ −type material, and it operates in both modes, this is an n −channel D-MOSFET.
4) The mask is derived from the structural operation of masks.

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

a) Define latch-up in CMOS circuits.
b) Write note on power dissipation in CMOS.
c) Mention two differences between static and dynamic CMOS logic.
d) Differentiate CMOS and NMOS.
e) Define threshold voltage in MOSFETs.
f) What are the issues in dynamic design of MOSFET?
g) Define the term "stick diagram" in VLSI layout design.
h) Classify the digital systems.

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

a) Explain Second order effects in MOS devices.
b) Explain Pass transistor logic and give examples.
c) Explain Common Source single stage amplifier.
d) Write a note on Ratioed logic.

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

a) Describe Cascading in Dynamic CMOS.
b) Write note on CAD VLSI tools.
c) Write λ-based design rules for NMOS and CMOS circuit design.

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

a) Explain Static latches and Registers.
b) Explain MOS Structure and its working with I-V characteristics.
c) Explain sensed based amplifiers.

SLR-PH-19

Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - IV) (New) (NEP CBCS)
Examination: March/April - 2026
Python and Machine Learning (2320405)

Day & Date: Tuesday, 21-04-2026 Max. Marks: 60
Time: 03:00 PM To 05:30 PM

Instructions: 1) Figures to the right indicate full marks.

Q.1 A) Select the correct answers: **08**

1) Python is a ____.
   a) Compiled language b) Interpreted language
   c) Assembly d) Machine

2) Which data type is immutable?
   a) List b) Dictionary
   c) Tuple d) Set

3) NumPy is used for ____.
   a) Web design b) Numerical computing
   c) Networking d) Al hardware

4) Pandas is mainly used for ____.
   a) Graphics b) Data analysis
   c) OS c) Compiler

5) Supervised learning uses ____.
   a) No data b) Labeled data
   c) Random data d) Images only

6) KNN stands for ____.
   a) K-Nearest Neighbors b) Kernel NN
   c) Known NN d) None

7) PCA is used for ____.
   a) Classification b) Clustering
   c) Dimensionality reduction d) Regression

8) Jupyter Notebook is ____.
   a) Compiler b) IDE
   c) OS d) Hardware

B) Fill in the blanks / True-False **04**

1) Python uses _____ typing.
2) JSON stands for _____.
3) Scikit-learn is used for _____.
4) Decision tree is a _____ algorithm.

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

a) Define Python.
b) Explain variables.
c) Define list.
d) What is function?
e) Define machine learning.
f) What is classification?
g) Define clustering.
h) What is Kaggle?

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

a) Explain data types in Python.
b) Explain loops in Python.
c) Explain NumPy basics.
d) Explain supervised learning.

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

a) Explain OOP in Python.
b) Explain Pandas library.
c) Explain Tuple & Dictionary with example.

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

a) Explain control statement in python with example.
b) Explain arithmetic & logical operators in python.
c) Explain ML case study (heart disease / wine dataset).