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M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Electronic System Design (2320101)

Day & Date: Wednesday, 29-10-2025 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) Which device can be used to convert a 4-bit binary number to Gray code?
   a) Full adder b) MUX
   c) XOR gate d) NAND gate

2) The output of an LVDT is: _____.
   a) Digital
   b) Capacitive
   c) Inductive
   d) Voltage proportional to displacement

3) A 555 timer IC can be used to generate: _____.
   a) Triangular wave b) Square wave
   c) Sine wave d) Sawtooth wave

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

5) The IC 741 is typically used as: _____.
   a) Voltage regulator b) Multivibrator
   c) Operational amplifier d) Schmitt trigger

6) Which sensor is used for humidity measurement?
   a) LVDT b) Thermistor
   c) Hygrometer d) Load cell

7) The output of a Schmitt trigger is a: _____.
   a) Continuous signal b) Noisy signal
   c) Clean square wave d) Sinusoidal wave

8) The IC 555 timer can be used to design: _____.
   a) Astable multivibrator b) Full adder
   c) Binary counter d) Differential amplifier

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

1) A full adder can be implemented using a _____.
2) Thermocouples generate a voltage based on the _____ effect.
3) A triangular waveform can be generated using a(n) _____ circuit.
4) A Schmitt trigger introduces _____ to prevent noise interference.

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

a) Explain the working principle of a thermocouple.
b) What is the difference between an astable and monostable multivibrator?
c) Explain need of signal conditioning in instrumentation.
d) Define the purpose of a frequency synthesizer.
e) Explain the use of RTDs in temperature measurement.
f) How does an LVDT work as a displacement sensor?
g) What are the advantages of using SMPS in power supply design?
h) What is a parity checker, and why is it used?

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

a) Design a binary-to-Gray code converter using XOR gates.
b) Design an Astable multivibrator using IC 555.
c) Explain the working of a capacitive level sensor.
d) How can a full adder be implemented using a multiplexer?

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

a) Design a triangular waveform generator using an op-amp.
b) Describe how to interface CMOS logic with TTL inputs.
c) Explain the working principle of a differential pressure cell.

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

a) How does a digital multimeter using the IC 7107 work?
b) Explain the design of monostable mv using IC 741.
c) Write a short note on:
i) RTD.
ii) Thermocouple.

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Set P

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: October/November – 2025
Digital Electronics and Verilog HDL (2320108)

Day & Date: Monday, 03-11-2025 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) What is the binary equivalent of the decimal number 13?
   a) 1010 b) 1101
   c) 1001 d) 1110

2) Which of the following is a combinational circuit?
   a) Flip-Flop b) Counter
   c) Decoder d) Register

3) The universal gates are: _____.
   a) AND, OR b) NOR, XOR
   c) NOR, NAND d) XOR, XNOR

4) In a 4x1 multiplexer, how many selection lines are required?
   a) 2 b) 3
   c) 4 d) 1

5) In Verilog, which of the following is used to model combinational logic?
   a) always @ (posedge clk)
   b) always @ (*)
   c) initial block
   d) assign block

6) A flip-flop operates in which mode?
   a) Sequential b) Combinational
   c) Both d) None

7) The Verilog keyword assign is used for: ____.
   a) Sequential logic
   b) Blocking assignment
   c) Continuous assignment
   d) Non-blocking assignment

8) The output of an XOR gate is high when: _____.
   a) Both inputs are 0 b) Both inputs are 1
   c) Inputs are different d) Inputs are the same

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) What is Combinational logic design?
b) What is Verilog HDL?
c) What is CPLD?
d) What is Multiplexer?
e) Define the term propagation delay in digital circuits.
f) Differentiate between SR latch and D latch.
g) Write the truth table for a 3-input AND gate.
h) What is the purpose of the #delay statement in Verilog?

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) Explain the working of a 4-bit ripple counter with a neat diagram.
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 Full subtractor using K map and realize it using basic gates.

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

a) Design a 4-bit synchronous counter and explain its operation with timing diagrams.
b) Design Octal to Binary Encoder.
c) Discuss the applications and design principles of FPGA in digital circuits.

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Set P

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: October/November - 2025
Research Methodology (2320103)

Day & Date: Thursday, 06-11-2025 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) _____ is the first step in the research process.
   a) Data collection b) Identifying the problem
   c) Data analysis d) Literature review

2) _____ type of research is aimed at solving a specific problem.
   a) Basic research b) Applied research
   c) Exploratory research d) Descriptive research

3) ____ judge the depth of any research.
   a) By research title
   b) By research duration
   c) By research objectives
   d) By total expenditure on research

4) _____ of the following is not the method of Research.
   a) Survey b) Historical
   c) Observation d) Philosophical

5) Exploratory research focused on_____.
   a) Testing hypotheses b) Finding new insights
   c) Measuring variables d) Explaining phenomena

6) _____ is the primary data.
   a) Data collected from books and journals
   b) Data collected directly from the source
   c) Data collected by someone else
   d) None of the above

7) Which of the following is an example of a primary data collection method?
   a) Government reports b) Questionnaires
   c) Textbooks d) Encyclopedias

8) The first page of the research report is ____.
   a) Appendix b) Bibliography
   c) Index d) Title Page

B) State true or false. **04**

1) Research always begins with the formulation of hypotheses.
2) A research design serves as the blueprint for conducting a study.
3) Qualitative research typically involves numerical data.
4) A sample is a subset of the population selected for a study.

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

a) Name two characteristics of a good hypothesis.
b) What is the purpose of a literature review in research?
c) Define Variable?
d) What is Layout of the research report?
e) What are different types of Graphs?
f) List the types of research?
g) Define research methodology.
h) What is the difference between qualitative and quantitative research?

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

a) Write objectives of research.
b) What are the key differences between primary and secondary data? Provide examples.
c) Write a note on Qualitative Data Analysis?
d) Write a note on Methods of Collecting Primary Data.

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

a) Explain types of research.
b) Explain characteristics of research.
c) Elaborate on the importance of ethical considerations in research.

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

a) Explain the steps involved in preparing a research proposal.
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: October/November - 2025
Control System (2320201)

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

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

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

1) The overall transfer function from block diagram reduction for cascaded blocks is _____
a) Sum of individual gain
b) Product of individual gain
c) Difference of individual gain
d) Division of individual gain

2) A node having only outgoing branches.
a) Input node b) Output node
c) Incoming node d) Outgoing node

3) Mass, in force-voltage analogy, is analogous to ____
a) charge b) current
c) inductance d) resistance

4) The commonly used frequency domain methods to sketch the frequency response of the systems are _____
a) Bode plot b) Polar plot and Nichol's chart
c) Nyquist plot d) All of these

5) In P-I controller, what does an integral of a function compute?
a) Density of curve b) Area under the curve
c) Volume over the curve d) Circumference of curve

6) What is the Laplace transform of a unit impulse function?
a) 1 b) s
c) e^(-s) d) 1/s

7) What is the transfer function of a derivative controller?
a) $K_d * s$ b) K_p / s
c) K_i / s d) K_d / s

8) What is the purpose of a lead compensator in control system design?

a) To increase system stability
b) To improve the system's transient response
c) To reduce system noise
d) To measure the system output

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

a) Gain margin is the amount by which the gain can be increased before the system becomes unstable.
b) The advantage of lock diagram representation is that it is possible to evaluate the contribution of each component to the overall performance of the system.
c) The breakaway point calculated mathematically must always lie on the root locus.
d) Loop which do not possess any common node are said to be touching loops.

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

a) Write Mason's gain formula.
b) Give the classification of control systems.
c) State the angle and magnitude criterion for root locus.
d) What is lead compensator.
e) List the Frequency domain specifications.
f) What is the effect of PI controller on the system performance?
g) What is Routh stability criterion?
h) Distinguish between open loop system and closed loop system.

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

a) Explain Block diagram Reduction rules.
b) Explain Electrical analogy.
c) What is PD controller and derive its expression.
d) Briefly describe the concept of stability.

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

a) Draw and explain RLC circuit and obtain its transfer function.
b) Explain the stability of given equation using Hurwitz method.

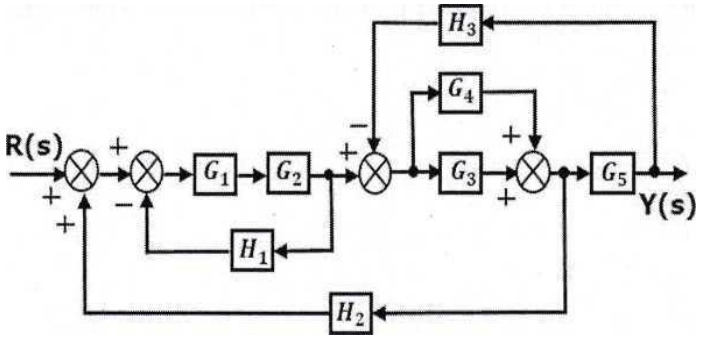
$$7S^3 + 5S^2 + 4S + 9 = 0$$

c) Consider the system with G(s).H(s) = K/S(S+2) (S+4). Find whether S= - 0.85+j.6 is on root locus or not using angle condition.

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

a) Explain the PID control action and list advantages and disadvantages.

b) Simplify the following block diagram using the block diagram reduction rules.



c) Explain the design of gear trains with its transfer function and draw its block diagram.

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Set **P**

M.Sc. (Electronics Science) (Semester - II) (New) (NEP CBCS)
Examination: October/November - 2025
Mechatronics (2320202)

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

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

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

1) _____ component is used to convert mechanical energy into electrical energy.
   a) Transformer b) Actuator
   c) Generator d) Sensor

2) _____ type of sensor is used to measure temperature.
   a) Thermistor b) Encoder
   c) Proximity sensor d) Gyroscope

3) _____ actuator is commonly used in robotic arms for precise motion.
   a) Pneumatic cylinder b) Stepper motor
   c) Hydraulic cylinder d) Solenoid

4) _____ is the function of a PLC (Programmable Logic Controller).
   a) Storing data d) Controlling industrial automation
   c) Displaying information d) Power

5) _____ is an example of an input device in mechatronic systems.
   a) Motor b) Conveyor belt
   c) Microphone d) Gearbox

6) _____ principle does a piezoelectric sensor work on.
   a) Capacitance change
   b) Resistance change
   c) Magnetic induction
   d) Electric charge from mechanical stress

7) _____ material is commonly used in MEMS (Micro-Electro-Mechanical Systems)?
   a) Silicon b) Aluminium
   c) Copper d) Plastic

8) _____ does SCADA stand for?
   a) Supervisory Control and Data Acquisition
   b) System Control and Digital Automation
   c) Signal Communication and Device Automation
   d) Smart Control and Data Analysis

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

1) Pneumatic systems use air under pressure as the working medium.
2) A sensor cannot be used to detect motion.
3) Hydraulic systems provide higher force compared to pneumatic systems.
4) Encoders are used for rotational position measurement.

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

a) Define the term "Mechatronics."
b) What is the primary function of a sensor in a mechatronic system?
c) Name two types of actuators used in mechatronic systems.
d) What is the purpose of feedback in a closed-loop control system?
e) Differentiate between analog and digital signals.
f) List two examples of applications of SCADA systems.
g) Explain the working principle of a solenoid.
h) What is the role of a microcontroller in a mechatronic system?

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

a) Explain the working principle of a stepper motor.
b) What are the advantages of using sensors in automation?
c) Differentiate between hydraulic and pneumatic systems.
d) What are the key components of a mechatronic system?

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

a) Explain the role of actuators in a mechatronic system with examples.
b) Explain Linkages, Screw & Fastener.
c) Explain mechatronics system.
   - Digital Camera

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

a) Explain Mechanical actuation system.
b) Explain BLDC motor & servo motor
c) What are the differences between open-loop and closed-loop control systems?

SLR-HH-10

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Set P

M.Sc. (Electronics Science) (Semester - II) (New) (NEP CBCS)
Examination: October/November - 2025
Advanced Microcontrollers and protocols (2320208)

Day & Date: Saturday, 01-11-2025 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) What is the processor used by ARM7?
   a) 8-bit CISC b) 8-bit RISC
   c) 32-bit CISC d) 32-bit RISC

2) What is the instruction set used by ARM7?
   a) 16-bit instruction set b) 32-bit instruction set
   c) 64-bit instruction set d) 8-bit instruction set

3) How many registers are there in ARM7?
   a) 35 registers (28 GPR and 7 SPR)
   b) 37 registers (28 GPR and 9 SPR)
   c) 37 registers (31 GPR and 6 SPR)
   b) 35 registers (30 GPR and 5 SPR)

4) What is the capability of ARM7 f instruction for a second?
   a) 110 MIPS b) 150 MIPS
   c) 125 MIPS c) 130 MIPS

5) In which of the following ARM processors virtual memory is present?
   a) ARM7DI b) ARM7TDMI-S
   c) ARM7TDMI d) ARM7EJ-S

6) A processor performing fetch or decoding of different instruction during the execution of another instruction is called _____.
   a) Super-scaling b) Pipe-lining
   c) Parallel Computation d) None of the mentioned

7) The interrupt-request line is a part of the _____.
   a) Data line b) Control line
   c) Address line d) None of the mentioned

8) What are the no of pins that are in the ARM7 processors?
   a) 65 pin with QFP b) 45 Pin with QFP
   c) 45 pin with LLC d) 65 pin with DIP

B) State true or false. **04**

1) The AVR7 processor wakes up from power down mode via external interrupt or BOD.
2) TDMI stands for Thumb, Debug, Multiplier, ICE.
3) ARM Stands for A-profile, Application profile, R-profile, Real-time profile M-profile, Microprocessor profile.
4) ARM 7 has not an in-built debugging device.

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

a) What is Program status register?
b) What are processor modes in ARM?
c) Write data types in ARM.
d) What is vector table in ARM?
e) Write four advantages of RISC architecture.
f) What are applications of CAN protocol?
g) What is I2C?
h) what is SPI?

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

a) Explain general purpose register with example.
b) Explain the embedded c project creation in Keil.
c) Explain pipeline structure in ARM.
d) Write & explain the code for switching of the ARM in from privileged mode.

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

a) Interface a LED to ARM and write embedded C program.
b) Interface the switch to ARM and write a embedded code to read status of switch.
c) Explain block diagram of ARM 7.

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

a) Explain I2C registers in ARM.
b) Explain CAN registers in ARM.
c) Explain SPI registers in ARM.

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M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: October/November - 2025
Internet of Things (2320301)

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

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

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

1) _____ protocol is lightweight and commonly used for IoT telemetry.
a) HTTP b) FTP
c) MQTT d) SMTP

2) _____ wireless technology is specifically optimized for low-power personal area networks.
a) WiFi b) LoWPAN
c) Ethernet d) 5G

3) _____ level does the router operate in the OSI reference model.
a) Data Link b) Network
c) Physical d) None of these

4) _____ of the following is not an IoT platform.
a) Amazon Web Services
b) Microsoft Azure
c) Salesforce
d) Flipkart

5) _____ of the following is NOT an IoT enabler.
a) Cloud platforms
b) Low-power wireless
c) Legacy landline PSTN
d) TinyML

6) In Raspberry Pi, GPIO stands for _____.
a) General Purpose Input Output
b) Global Peripheral I/O
c) General Processor I/O
d) Graphical Pin I/O

7) In MQTT, the component that delivers messages to subscribed clients is called _____.

a) Broker b) Publisher
c) Subscriber d) Router

8) UAV networks in IoT are mainly used for _____.

a) underwater sensing
b) aerial sensing and rapid deployment
c) wired backbone
d) analog signal processing

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

1) Sensor cloud refers to integrating sensors with cloud services.
2) The storage is limited in IoT.
3) Actuators of the following is used to capture data from the physical world in IoT devices.
4) MQTT uses TCP as its transport protocol.

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

a) Give two applications of IoT in agriculture.
b) What is CSMA and why is it relevant to IoT networking.
c) Explain what is wireless sensor network.
d) Define Internet of Things.
e) What are the features of Raspberry Pi?
f) List three common sensors used in environmental monitoring.
g) State two challenges of interoperability in IoT systems.
h) What are the differences between IoT and M2M?

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

a) Discuss different challenges of IoT.
b) Explain the MQTT publish-subscribe model with a diagram (brief).
c) What is cloud computing? Explain block diagram of cloud computing.
d) Describe ADC interfacing to Raspberry Pi and why ADC is required.

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

a) What is sensor? Explain different types of sensors used in IoT.
b) Explain different network IoT communication Protocols.
c) Discuss cloud service models (IaaS, PaaS, SaaS).

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

a) Design a simple temperature monitoring system using ThingSpeak or similar IoT service. Provide block diagram and main steps.
b) What are different advantages & disadvantages of IoT?
c) Explain simplified IoT architecture.

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Set P

M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: October/November – 2025
Advance Embedded System (2320302)

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

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

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

1) The main difference between embedded systems and general computing systems is _____.
a) Embedded are always high power
b) Embedded have dedicated function and resource constraints
c) Embedded cannot be networked
d) Embedded always run Windows

2) CAN bus is most known for use in _____.
a) Desktop networks b) Automotive systems
c) Home Wi-Fi d) Bluetooth

3) USB supports which of the following transfer types?
a) Simplex only
b) Isochronous, Bulk, Interrupt and Control,
c) Token ring
d) CSMA/CD

4) SPI mode includes CPOL and CPHA parameters: CPOL sets _____ and CPHA sets _____.
a) Clock polarity; clock phase b) Data length; parity
c) Addressing; speed d) Stop bits; start bits

5) Task starvation in an RTOS typically occurs because _____.
a) Proper priorities assigned
b) Low priority tasks never get CPU due to higher priority tasks preempting
c) Memory is abundant
d) There are no interrupts

6) A mailbox in RTOS is used for _____.
a) Task scheduling
b) Passing messages/structures between tasks
c) Memory addressing
d) Debugging only

7) Thumb instructions are beneficial because they _____.
a) Increase code size
b) Reduce code density
c) Improve code density and reduce memory footprint
d) Remove pipelining

8) RTC module in embedded systems is used for _____.
a) Real-time clock/calendar keeping
b) Reset control
c) PWM generation
d) ADC conversions

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

1) CAN stands for _____.
2) SPI is _____.
3) True/False: RTOS guarantees hard real-time behavior regardless of design.
4) True/False: USB supports plug-and-play enumeration.

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

a) What is ISR's typical constraints (two points)?
b) Define semaphore and mutex difference in brief.
c) Why use memory protection or MPU in embedded systems?
d) Name two peripherals are commonly used for real-time timestamping.
e) What is mailbox vs message queue?
f) Give one power management technique used in embedded design.
g) What is vector table relocation and why used?
h) Give a reason to use USB instead of UART.

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

a) Explain mailbox, message queue and pipes in RTOS and example use-case for each.
b) Describe CAN bus arbitration and why no data collision occurs.
c) Outline steps in interfacing a character LCD to microcontroller.
d) Explain scheduling (priority-based preemptive vs round-robin) with one pro and con each.

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

a) Explain how USB descriptors and enumeration work (high level).
b) Discuss static allocation, dynamic allocation, pools memory management strategies in embedded RTOS
c) Explain power sequencing and brown-out detection role in embedded boards.

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

a) Design considerations when interfacing high-speed ADC to MCU (clocking, buffering, DMA).

b) Explain how timers/counters are used for event timestamping and input capture.

c) Compare USB bulk and isochronous transfers and give one device type for each.

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M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: October/November – 2025
Optical Fiber Communication (2320306)

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

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

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

1) The phenomenon that confines light within an optical fiber is: ____.
   a) Diffraction b) Total internal reflection
   c) Refraction d) Scattering

2) The parameter that determines the number of modes in a step-index multimode fiber is: ____.
   a) Numerical Aperture b) Cut-off wavelength
   c) Core diameter d) Both A and C

3) PIN photodiode differs from APD in that APD provides: ____.
   a) Lower sensitivity b) Internal gain
   c) Faster response d) No reverse bias

4) Intermodal dispersion in a multimode fiber is primarily caused by: ____.
   a) Chromatic dispersion
   b) Different path lengths of modes
   c) Scattering losses
   d) Connector loss

5) LED light source is preferred over laser when: ____.
   a) Coherent light is required
   b) High modulation bandwidth is needed
   c) Low cost and wide emission is preferred
   d) Single spatial mode is required

6) The numerical aperture (NA) of an optical fiber is related to core and cladding refractive indices as: ____.
   a) $sqrt(n1\text{^}2 - n2\text{^}2)$ b) $n1 - n2$
   c) $n2/n1$ d) $n1 + n2$

7) Modal dispersion can be reduced by using: ____.
   a) Step-index multimode fiber b) Single-mode fiber
   c) Increased core diameter d) Loose connectors

8) A fiber splice is primarily used to: ____.
   a) Convert optical signal to electrical
   b) Join two fibers with low loss
   c) Amplify the signal
   d) Change wavelength

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

1) The condition for total internal reflection is that the angle of incidence must be _____the critical angle.
2) An Avalanche Photodiode (APD) requires _____ bias to operate.
3) Chromatic dispersion arises due to variation of _____ with wavelength.
4) Numerical aperture is a measure of the light acceptance _____ of the fiber.

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

a) Explain briefly the concept of numerical aperture (NA) and give its expression for a step-index fiber.
b) List four major sources of attenuation in optical fibers.
c) What is cut-off wavelength? Explain its significance for single-mode operation.
d) Compare LED and semiconductor laser in two points relevant to optical communication.
e) Describe what is meant by splice and connector; give one advantage of each.
f) Define material dispersion and waveguide dispersion.
g) Give two methods to measure fiber attenuation.
h) What is a coupler in fiber optics and mention one application.

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

a) Derive the expression for acceptance angle of an optical fiber and relate it to NA.
b) Explain the working principle of PIN photodiode and list typical responsivity values.
c) Discuss intermodal dispersion and how graded-index fibers reduce it.
d) Explain fiber bending loss and factors affecting it.

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

a) Describe the construction and working of a semiconductor laser used as an optical source. Include sketch.
b) Explain measurement of numerical aperture and core/cladding refractive indices using refracted near-field or other suitable technique.
c) What is Optical Time Domain Reflectometry (OTDR)? Explain its basic principle and applications.

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

a) Explain various components and block diagram of a typical optical communication system with emphasis on transmitter and receiver functions.

b) Discuss digital modulation techniques used in optical communication (PCM, ASK, PSK) and mention one advantage of PSK over ASK.

c) Explain briefly the concept of wavelength division multiplexing (WDM) and its importance in modern fiber networks.

Seat No.	

Set | P

M.Sc. (Electronics Science) (Semester - III) (New) (NEP CBCS)
Examination: October/November - 2025
Microwave Devices and Applications (2320307)

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

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

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

1) The main advantage of a TWT over a klystron is:
   a) Higher power capability
   b) Better efficiency at low frequencies
   c) Wider bandwidth
   d) Simpler construction

2) The anode of a cavity magnetron is typically constructed with: ____.
   a) Resonant cavities b) A helical slow-wave structure
   c) Drift tubes d) A dielectric coating

3) Which parameter of an antenna determines the concentration of radiated power in a specific direction?
   a) Gain b) Beam width
   c) Polarization d) Input impedance

4) The input impedance of an antenna at resonance is typically:
   a) Purely resistive
   b) Purely reactive
   c) A combination of resistance and inductance
   d) Zero

5) Which type of polarization is typically used in FM broadcasting?
   a) Circular polarization b) Vertical polarization
   c) Horizontal polarization d) Elliptical polarization

6) Which type of diode is known for generating microwave frequencies through avalanche breakdown and transit-time effects?
   a) Tunnel diode b) Gunn diode
   c) IMPATT diode d) TRAPATT diode

7) Which of the following is true about waveguide cutoff frequency?
   a) It is the maximum frequency a waveguide can operate at
   b) Below it, the waveguide will not support propagation
   c) It is always determined by the waveguide's length
   d) It only applies to circular waveguides

8) A phase shifter is used to: _____.
   a) Amplify microwave signals
   b) Change the frequency of a signal
   c) Adjust the phase of a signal without altering amplitude
   d) Decrease signal power

B) Write true/false **04**

1) A matched transmission line has a reflection coefficient of 0.
2) The negative resistance in a Gunn diode arises from the quantum tunneling phenomenon.
3) A magnetron oscillator generates microwave energy by using the interaction between an electron beam and a magnetic field.
4) A parabolic reflector antenna provides a wide beamwidth and low gain.

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

a) List the different types of reflector antennas.
b) State the function of a circulator in microwave systems.
c) State the formulas for coupling factor, Directivity and Isolation in Directional couplers.
d) Explain Tunneling in Tunnel Diode.
e) Differentiate Reflex and Two Cavity Klystrons.
f) Draw neat labelled diagram of Travelling Wave Tube.
g) What is Gain in Antennas?
h) What is Directivity in Antennas?

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

a) Explain Short Dipole antennas and write its advantages and applications.
b) Explain structure and working of Gunn Diode.
c) Explain structure and working of IMPATT Diode.
d) Explain Linear Antenna Array with neat diagram.

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

a) Write a note on Rectangular Waveguide and deduce its wave equations.
b) Explain Transmission lines and its parameters.
c) Explain Yagi-Oda antennas & write its advantages, disadvantages and applications.

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

a) Explain Structure and Working of Two Cavity Klystron.
b) Explain the structure, working and characteristics of Tunnel Diode.
c) Explain construction and working of Rhombic Antennas & its radiation pattern.

Seat No.	

Set | P

M.Sc. (Electronics Science) (Semester - IV) (New) (NEP CBCS)
Examination: October/November - 2025
PLC and SCADA (2320401)

Day & Date: Tuesday, 28-10-2025 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) The standard form of RTU is ____.
a) Reverse Terminal Unit b) Remote Terminal Unit
c) Reverse Unit d) None of the above

2) The standard form of MTU is ____.
a) Master Terminal Unit
b) Main Machine Interface
c) Main Unit
d) None of the above

3) The standard form of HMI is ____.
a) Human Master Interface b) Human Machine Interface
c) Human Main Interface d) None of the above

4) ____ are the types of SCADA systems.
a) Monolithic, Distributed
b) Monolithic, Networked
c) Monolithic, Distributed, Networked
d) None of the above

5) The standard form of MMI is ____.
a) Main Machine Interface b) Master Machine Interface
c) Man Machine Interface d) None of the above

6) SCADA can be used in ____.
a) Manufacturing b) Mass transit
c) Traffic signals d) All of the above

7) Complex SCADA system have ____ levels.
a) One b) Two
c) Three d) Four

8) The SCADA system performs ____.
a) Data presentation
b) Data acquisition
c) Networked data communication
d) All of the above

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

1) The full form of SCADA is supervisory control and data acquisition.
2) Object oriented programming principle in clear SCADA system.
3) Tag/data logging alarm Report are the features SCADA system.
4) The human machine interface information like Temperature, pressure, Running time, material counts, the process steps, etc.

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

a) Write a ladder program for AND gate. Draw its truth table.
b) Differentiate between SCADA and PLC.
c) Write a short Note on Coaxial Cable.
d) Differentiate between Guided and Unguided media.
e) Write a short note on DB9 connector standard.
f) Differentiate between Open loop and Closed loop system.
g) Explain function of Application layer.
h) Explain the function Transport layer.

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

a) With a neat diagram explain the TCP/IP reference model in short.
b) What is OSI reference model? Explain each layer of stack in short.
c) Write a short note on Twisted Pair cable.
d) Compare MODBUS and PROFIBUS on any six points.

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

a) Draw block diagram of SCADA. Explain each block in brief.
b) What is serial communication? Explain the RS-485 interface standard.
c) What is Transmission media? Explain the Optical fiber media in detail.

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

a) Explain about PLC Timers and Counters with example.
b) Draw the block diagram of PLC and explain the function of CPU.
c) Define following w.r.t. DCS system:
i) Tags
ii) Function block
iii) Nodes
iv) Alarms

Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - IV) (New) (NEP CBCS)
Examination: October/November - 2025
Integrated Circuits and VLSI (2320402)

Day & Date: Thursday, 30-10-2025 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) Switch logic is based on _____.
   a) pass transistors
   b) transmission gates
   c) pass transistors and transmission gates
   d) design rules

2) Depletion mode MOSFETs can operate in _____ mode.
   a) Enhancement b) Depletion
   c) both a and b d) Can't say

3) For MOSFET is to be used as a switch then it must operate in _____.
   a) Cut-off region
   b) Triode region
   c) Saturation region
   d) Both cut-off and triode region can be used

4) The enhancement type basically termed as normally-OFF MOSFET works only with _____.
   a) large positive gate voltage
   b) large negative gate voltage
   c) large positive drain voltage
   d) large negative drain voltage

5) The lower turn off time of MOSFET when compared to BJT can be attributed to which one of the following?
   a) input impedance
   b) positive temperature coefficient
   c) absence of minority carriers
   d) on-state resistance

6) _____ architecture is used to design VLSI.
   a) system on a device b) single open circuit
   c) system on a chip d) system on a circuit

7) What is the standard form of CCD image sensor?
   a) Charge Coupled Device b) Charged Common Device
   c) Common Coupled Device d) None of the above

8) Switch logic is designed using _____.
   a) Complementary switches b) Silicon plates
   c) Conductors d) Resistors

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

1) Devices designed with lambda design rules are prone to shorts and opens.
2) The mask is derived from the structural operation of masks.
3) Basic AND and OR gate combinations are used in switch logic.
4) An enhancement-type MOSFET or E-MOSFET can be turned on when the channel is depleted.

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

a) Classify the digital logic systems.
b) List two advantages of using cascade current mirrors.
c) Mention two differences between static and dynamic CMOS logic.
d) Write two limitations of using long-channel MOS devices.
e) Write note on transmission gate logic.
f) What is channel-length modulation in MOS transistors?
g) Write note on RTL.
h) Write two causes of clock skew in synchronous circuits.

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

a) Explain Pass transistor logic and give examples.
b) Explain Common Gate single stage amplifier.
c) Draw and explain the lambda-based stick diagram for a CMOS inverter.
d) Explain Common Drain single stage amplifier.

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

a) Explain the latest trends in VLSI circuit design
b) Explain common and differential modes of Differential Amplifiers.
c) Explain the Hierarchical design of VLSI.

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

a) Explain pulse Registers and sense-based amplifiers.
b) Explain MOS Structure and its working with I-V characteristics.
c) Explain the design flow of ASIC design.

SLR-HH-19

Seat No.		Set	P

M.Sc. (Electronics Science) (Semester - IV) (New) (NEP CBCS)
Examination: October/November – 2025
Python and Machine Learning (2320405)

Day & Date: Saturday, 01-11-2025 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 answer. **08**

1) Who developed Python Programming Language?
   a) Wick van Rossum b) Rasmus Lerdorf
   c) Guido van Rossum d) Niene Stom

2) Which type of Programming does Python support?
   a) object-oriented programming
   b) structured programming
   c) functional programming
   d) all of the mentioned

3) Which of the following is the correct extension of the Python file?
   a) .python b) .pl
   c) .py d) .p

4) Which of the following is used to define a block of code in Python language?
   a) Indentation b) Key
   c) Brackets d) All of the mentioned

5) In supervised learning, which of the following is required?
   a) Labeled data b) Only numerical data
   c) Unlabeled data d) Only categorical data

6) What type of data is considered unstructured?
   a) Data in relational databases
   b) Data in spreadsheets
   c) Data in CSV files
   d) Text documents and images

7) What is the purpose of using the ‘Train-test split’ method?
   a) To evaluate the performance of a machine learning model
   b) To clean the data
   c) To visualize the data
   d) To reduce the dimensionality of the data

8) What is data science primarily concerned with?
   a) Analyzing and interpreting data
   b) Collecting data only
   c) Storing data in database
   d) All of the above

B) State true or false. **04**

1) Python is a case-sensitive programming language.
2) The print () function in Python can only display string values.
3) In Python, variables must be declared with a specific data type before assignment.
4) The input () function is used to receive user input from the console.

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

a) Define a variable in Python. Provide an example.
b) List any two data types in Python.
c) What is the difference between the = and == operators in Python?
d) How do you take user input in Python?
e) What is the output of type (10.5) in Python?
f) Define a tuple in Python and mention one key difference between a list and a tuple.
g) What is the use of the shelve module in Python?
h) List any two features of the Scikit-learn library.

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

a) Write a Python function to check whether a number is even or odd.
b) Explain the differences between list, tuple, and dictionary with examples.
c) Explain the different arithmetic operators in Python with examples.
d) Describe the use of logical operators in Python with examples.

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

a) Write a Python program to convert temperature from Celsius to Fahrenheit.
b) Explain the concept of variables in Python. How are they declared and initialized? Provide examples.
c) Write a Python program to find the largest among three numbers entered by the user.

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

a) Describe any two unsupervised learning algorithms and show their application on datasets from Kaggle.
b) Write a Python program to calculate the factorial of a number using a loop.
c) Describe the differences between int, float, and complex data types in Python with examples.

SLR-HH-24

Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - IV) (New/Old) (CBCS) Examination: October/November – 2025
PLC and SCADA (MSC02403)

Day & Date: Saturday, 01-11-2025 Max. Marks: 80
Time: 03:00 PM To 06:00 PM

Instructions: 1) Q. no. 1 & 2 are compulsory.
2) Attempt any Three Questions from Q No.3 to Q No.7.
3) Figures to the right indicate full marks.

Q.1 A) Choose correct alternative. **10**

1) _____ programming language is typically used to program a PLC.
   a) C++ b) JAVA
   c) Python d) Ladder logic

2) The SCADA systems used to _____.
   a) Monitor b) Control
   c) Both a and b d) None of the above

3) _____ type of power supply is used for PLC.
   a) AC b) DC
   c) Both a & b d) Solar

4) _____ memory and input/output modules are the main component of PLC.
   a) CPU b) Sensors
   c) Actuators d) Pneumatics

5) The number of layers in ISO OSI reference model is _____.
   a) 6 b) 4
   c) 5 d) 7

6) _____ is the max length of the Shielded twisted pair cable.
   a) 100m b) 200m
   c) 100ft d) 200ft

7) TCP/IP Reference Model is a _____ layered suite of communication protocols.
   a) 1 b) 2
   c) 4 d) 3

8) Modbus communication protocol was developed in _____ year.
   a) 1970 b) 1960
   c) 1980 d) 1990

9) Complex SCADA system have _____ levels.
   a) One b) Two
   c) Three d) Four

10) USB 2.0 supports up to _____ mbps speed.
   a) 100 b) 280
   c) 480 d) 580

B) Fill in the blanks or write True or false. **06**

1) The full form of SCADA is Supervisory Control and Document Acquisition.
2) The standard form of DCS is Distributed Control System.
3) The first-generation SCADA systems were developed or designed in 1970.
4) RS-485 is a widely used parallel communication standard.
5) For RS-232 Binary 1 works with voltages up to -5V to -15Vdc.
6) Fiber Optic works on the properties of light.

Q.2 Answer the following. **16**

a) Write down functions of SCADA.
b) Explain in short, the Earthing/Grounding concept.
c) Write a short note on Coaxial Cable.
d) Differentiate between Guided and Unguided media.

Q.3 Answer the following.

a) What is OSI reference model? Explain each layer of stack in details. **10**
b) Write a short note on Twisted Pair cable. **06**

Q.4 Answer the following.

a) Explain about the Guided Transmission Medias in detail. **10**
b) Write a short note on PID Control using PLC. **06**

Q.5 Answer the following.

a) What is serial communication? Explain in detail the RS-485 interface standard. **08**
b) What is Transmission media? Explain the Optical fiber media in detail. **08**

Q.6 Answer the following.

a) With a neat diagram explain TCP/IP reference model give a brief description of. **08**
b) Describe the basic architecture of a CAN bus system. **08**

Q.7 Answer the following.

a) Draw block diagram of SCADA. Explain each block in brief. **10**
b) Explain in short the MODBUS Protocol with help of neat diagram. **06**

Seat No.	

Set P

M.Sc. (Electronics Science) (Semester - I) (New) (NEP CBCS)
Examination: October/November – 2025
Microcontroller & Interfacing (2320102)

Day & Date: Friday, 31-10-2025 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 correct answer. **08**

1) _____ timers are available in PIC16F877A.
   a) 2 b) 3
   c) 4 d) 5

2) _____ memory is used for storing the firmware in PIC16F877A.
   a) EEPROM b) Flash
   c) SRAM d) ROM

3) _____ is the purpose of the watchdog timer in PIC16F877A.
   a) Debugging b) Preventing infinite loops
   c) Enhancing speed d) Increasing memory

4) _____ interrupt sources are available in PIC16F877A.
   a) 10 b) 14
   c) 18 d) 21

5) _____ is the instruction cycle time of PIC16F877A for a 20 MHz clock.
   a) 200 ns b) 400 ns
   c) 500 ns d) 1 μs

6) _____ is the word size of the AVR32 microcontroller?
   a) 8-bit b) 16-bit
   c) 32-bit d) 64-bit

7) _____ type of architecture does the AVR32 microcontroller use.
   a) Harvard b) Von Neumann
   c) RISC d) CISC

8) _____ of the following is an advanced feature of AVR32.
   a) Single-cycle execution b) SIMD instructions
   c) Hardware multiplication d) All of the above

B) State true or false. **04**

1) The maximum clock frequency supported by AVR32 is 150 MHz.
2) AVR32 support JTAG debugging feature.
3) The addressable memory space of AVR32 is 2 GB.
4) PIC16F877A use Von Neumann type of architecture.

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

a) How does the Harvard architecture benefit the PIC16F877A microcontroller?
b) Explain the purpose of timers in PIC16F877A.
c) How is the EEPROM memory used in PIC16F877A?
d) What is the role of the status register in PIC16F877A?
e) Explain the interrupt handling mechanism in AVR32.
f) What are the common applications of AVR32 microcontrollers?
g) Compare the data bus width of AVR32 with that of PIC16F877A.
h) Describe the function of the JTAG interface in AVR32.

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

a) Explain registers of PIC16F877A.
b) Describe the working of the ADC module in PIC16F877A, including its configuration and applications.
c) Explain how serial communication is achieved using the USART module in PIC16F877A.
d) Explain the steps involved in programming the PIC16F877A microcontroller using MPLAB.

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

a) Explain the architecture of the PIC16F877A microcontroller with a labelled diagram.
b) Explain the applications of AVR32 microcontrollers in embedded systems with examples.
c) Explain the power management features in AVR32 and how they optimize energy consumption.

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

a) Describe the process of interfacing an Push button with PIC16F877A with circuit diagram
b) Describe the process of interfacing of LM35 temperature sensor with PIC16F877A.
c) Explain the architecture of the AVR32 microcontroller with a labelled diagram.