

Total No. of Questions : 7]

SEAT No. :

PD3559

[Total No. of Pages : 3

[6484]-101

First Year M.Sc.

ELECTRONIC SCIENCE

ELS 501 MJ : Analog System Design

(2023 Credit Pattern) (Semester-I) (4 Credits) (NEP)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question No.1 is compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Question 2 to 7 carry equal marks.
- 4) Neat diagrams must draw wherever necessary.

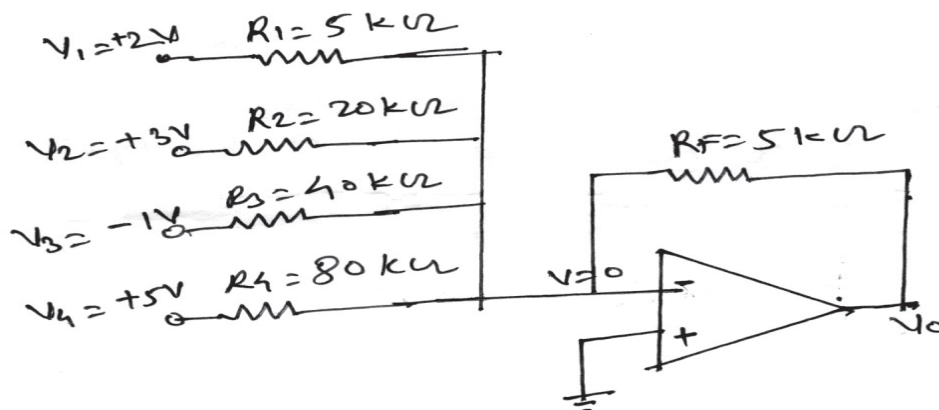
Q1) Solve any Five of the following.

[10]

- a) State equivalent model of an op-amp.
- b) State advantages of active filters over passive filters.
- c) Draw high frequency equivalent circuit of MOSFET in cs configuration.
- d) List types of sinusoidal and non sinusoidal oscillators.
- e) State need of multistage amplifier.
- f) Define static resistance and dynamic resistance.

Q2) Answer the following.

- a) Illustrate the inverting and non inverting configurations of op-amp circuits. Determine the output voltage and current through the resistance R_F in the circuit shown in Fig. [7]



P.T.O.

- b) Explain different coupling scheme of multistage amplifier. Three stage multistage amplifier has its first stage amplifier with voltage gain

$A_{v1} = 1000$, second amplifier stage gain with

$A_{v2} = 100$ and third amplifier stage with gain

$A_{v3} = 10$. Calculate the effective voltage gain, A_{VE} of cascaded amplifier in decibels. [5]

Q3) Answer the following.

- a) What is piezoelectric effect? Draw an equivalent circuit of a Quartz crystal and explain how oscillation can be generated in electronic circuits, using crystal. A crystal has following parameters $L_s = 4.2H$, $C_s = 0.06 PF$, $C_p = 1PF$, $R = 3kHz$. Find the series & parallel resonant frequency. [7]
- b) Explain the terms static resistance and dynamic resistance. Find the value of dc resistance and ac resistance of Germanium junction diode at $25^\circ C$ with $I_D = 20\mu A$ and applied voltage of $0.2V$ across the diode. [5]

Q4) Answer the following.

- a) Explain the working of n channel MOSFET in depletion and enhancement mode. For n channel depletion mode MOSFET parameters given below $V_{Ta} = -2V$, $K_N = 0.2mA/V^2$. Assume that $V_{DD} = 10V$ and $R_s = 50\Omega$? Determine I_D and V_{DS} . [7]
- b) With circuit diagram illustrate practical integrator and practical differentiator circuit using op-amp. [5]

Q5) Answer the following.

- a) Distinguish between synchronous and stagger tuned amplifier. In capacitive coupled single stage tuned amplifier circuit the bandwidth is $5 kHz$ and voltage gain has the maximum value at $1000 kHz$. When the tuning capacitor is adjusted to $500 pF$ calculate: [7]
- The inductance of coil and
 - The Q of the circuit
- b) State advantages of an Instrumentation amplifier. Design cross coupled instrumentation amplifier for voltage gain 60 . [5]

Q6) Answer the following.

- a) Draw the circuit diagram of two stage RC coupled amplifier using BJT and its equivalent circuit. Derive the expression for its overall voltage gain. [7]
- b) Explain the frequency response of common source FET amplifier. [5]

Q7) Write short notes on any two of the following. [12]

- a) LC oscillator
- b) Active filter approximation technique.
- c) Distortion in amplifier



Total No. of Questions : 7]

SEAT No. :

PD3560

[Total No. of Pages : 2

[6484]-102

M.Sc. - I

ELECTRONIC SCIENCE

**ELS-502-MJ: Advanced Digital System Design Using Verilog
(2023 Credit Pattern) (Semester - I)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Q.2 to Q.7 carry equal marks.

Q1) Attempt any five of the following:

[10]

- a) What are fixed function ICS?
- b) Define: SPLD.
- c) State net and register data types in Verilog.
- d) What is testbench?
- e) State the function of magnitude comparator.
- f) What is FSM?

Q2) Answer the following.

- a) i) Draw the block diagram of PAL and explain it. **[3]**
ii) Write the characteristics of “assign” statement. **[4]**
- b) What is DRAM? Why memory refreshing is required in DRAM? **[5]**

Q3) Answer the following.

- a) i) What is programmable array? What are its type? **[3]**
ii) What is excitation table? Write verilog code for J-K Flip-Flop using behavioral modeling. **[4]**
- b) What is multiplexer? Implement the following function using multiplexer. **[5]**
$$f(A, B, C, D) = \Sigma (0, 3, 5, 8, 12, 14)$$

P.T.O.

Q4) Answer the following.

- a) i) Write verilog code for half adder using gate level modeling. [3]
- ii) Compare PLA and PAL. [4]
- b) Draw the one digit display system diagram using IC7447. Explain the function of LT, RBI and BI/RBO pin in IC7447. [5]

Q5) Answer the following.

- a) i) What is GAL? What makes GAL reprogrammable? [3]
- ii) Design Gray to Binary decoder. [4]
- b) Design 4-bit counter using J-K Flip-Flop. [5]

Q6) Answer the following.

- a) i) Explain tree multiplexing using example. [3]
- ii) What is LUT? Implement full adder using LUT. [4]
- b) What is race around condition? How it is overcome in Master-Slave J-K Flip-Flop. [5]

Q7) Answer any two of the following.

- a) Explain shift operators and bitwise operators in Verilog. [6]
- b) How demultiplexer is used as decoder? Write the verilog code for 1:4 demultiplexer. [6]
- c) What is shift register? Explain ring counter using neat diagram. [6]



Total No. of Questions : 5]

SEAT No. :

PD3561

[Total No. of Pages : 2

[6484]-103

M.Sc. - I

ELECTRONIC SCIENCE

ELS-503-MJ: Mathematical Methods in Electronics
(NEP 2023 Credit Pattern) (Semester - I) (2 Credit)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

Q1) Solve any five of the following:

[5]

- a) What are the types of Laplace transform?
- b) Define transfer function.
- c) What is time invariant system?
- d) What 'ode45' command will do in MATLAB?
- e) Define unit step function.
- f) Define laplace transform.

Q2) Answer the following.

- a) i) Explain time shifting property of Z-transform. [2]
ii) Write a MATLAB program to find laplace transform of $f(t) = \sin(2t) \cos(2t)$. [4]
- b) Explain different classification of signal. [4]

Q3) Answer the following.

- a) i) What are the Limitations of fourier transform? [2]
ii) Find the inverse Laplace transform of $f(s) = \frac{2s + 5}{s^2 + 5s + 6}$. [4]
- b) What is difference between Digital filter and analog filter? [4]

P.T.O.

Q4) Answer the following.

- a) i) Write a MATLAB program to plot $\cos(x)$ function. [2]
- ii) Find a current flowing through the series RL network using laplace transform. [4]
- b) What is mean by bode plot? Explain semilog and loglog command in MATLAB. [4]

Q5) Write a short notes on any four of the following. [10]

- a) Give the classification of periodic and aperiodic signal.
- b) Explain the syntax of following MATLAB command.
- c) What is mean by Roc? Give its significance.
- d) List any five properties of Z-transform.
- e) Find out the laplace transform of e^{at} .
- f) State and explain the sampling theorem.



Total No. of Questions : 5]

SEAT No. :

PD3562

[Total No. of Pages : 2

[6484]-104

M.Sc. - I

ELECTRONIC SCIENCE

ELS 510 MJ : Fundamentals of Instrumentation System
(2023 Credit Pattern) (NEP) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Solve any 5 of the following. [5]

- a) Define following static parameter : Resolution.
- b) What is meant by passive instruments? Give example.
- c) What is sensitivity error in terms of transducer?
- d) Give applications of DSO in terms of band width and impedance.
- e) Give specifications of Digital Frequency meter.
- f) State different sources of error.

Q2) Answer the following questions.

- a)
 - i) Write the difference between deflection and null type of instruments giving suitable examples. [3]
 - ii) Calculate the maximum velocity of the beam of electrons in a CRT having anode voltage of 800V, assume that the charge of electron = $1.6 \times 10^{-19} \text{C}$ and mass of electron = $9.1 \times 10^{-31} \text{ kg}$. [3]
- b) Define dynamic response of a system and distinguish between steady state response and transient response. [4]

P.T.O.

Q3) Answer the following questions.

- a) Explain the constuction, working principle and application of LVDT with neat diagram. [6]
- b) List down the limitations of wheatstone bridge. [4]

Q4) Answer the following questions.

- a) i) A standard cell has avoltage rating of 1.0185V and an internal resistance of 500Ω . The insulation resistance between its terminal is $5m\Omega$. Find the current drain due to insulation resistance calculate difference between internal and terminal voltage. [3]
- ii) Explain the construction of strain gauge. Derive the expression for the gauge factor. [3]
- b) Classify the transducers based on the transconnection principle. [4]

Q5) Write short notes on any four of the following. [10]

- a) IEEE standards
- b) Resistance Temperature Detectors (RTDs)
- c) Computational error
- d) Active instruments
- e) Null type recorders
- f) LCR meter



Total No. of Questions : 5]

SEAT No. :

PD3563

[Total No. of Pages : 2

[6484]-105

M.Sc. - I

ELECTRONIC SCIENCE

**ELS 511 MJ : Introduction to Artificial Intelligence and
Machine Learning**

(2023 Credit Pattern) (NEP) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*
- 5) *Use of non - programmable calculator is allowed.*

Q1) Solve any five of the following. [5]

- a) Define the term AI.
- b) State different types of AI agent.
- c) What do you mean by machine learning?
- d) What are the basic concepts of Neural Network?
- e) State overview of AI problem.
- f) What are the main types of problems AI aims to solve?

Q2) Answer the following.

- a) Discuss the evolution of AI technologies and methodologies over the decades. [6]
- b) Explain the k-nearest neighbours algorithm and it's application. [4]

Q3) Answer the following.

- a) Explain the architecture and functionality of multilayer perceptrons in neural network. [6]
- b) Identify and describe five major applications of AI in today's world. [4]

P.T.O.

Q4) Answer the following.

- a) Explain the ID3 algorithm and its application in decision trees. [6]
- b) What does rationality mean in the context of AI and why is it important. [4]

Q5) Write short notes on any four of the following. [10]

- a) K-mode clustering
- b) Hill climbing
- c) PAC learning
- d) Linear regression
- e) Grouping and Grading
- f) VC Dimension



Total No. of Questions : 5]

SEAT No. :

PD3564

[Total No. of Pages : 2

[6484]-106

M.Sc. - I

ELECTRONIC SCIENCE

**ELS 512 MJ : Fundamental and Applications of PIC Microcontroller
(NEP 2023 Credit Pattern) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Questions 2 to 5 carry equal marks.

Q1) Answer any five of the following.

[5×1=5]

- a) What is the bit size of WREG of PIC18?
- b) What is the meaning of a step angle of stepper motor?
- c) To which register does the BRGH bit belong?
- d) What do RISC and CISC stand for?
- e) Give two factors that affect the step size calculation in ADC.
- f) Find the hexadecimal code to display '4' on common Anode seven segment display?

Q2) Answer the following.

[10]

- a) i) What is the role of TRIS_x register in input output port programming?[2]
- ii) Draw and explain the block diagram of PIC18. [4]
- b) Write the PIC18 'C' program to make LED ON/OFF at PORT A, according to switch connected at pin RC1. [4]

Q3) Answer the following.

[10]

- a) i) Find the clock period fed into timero if a prescaler option of 1024 is chosen. Assume XTAL - 10MHz. [2]
- ii) What is interrupt? Give the difference between polling and priority interrupt. [4]
- b) For XTAL = 10MHz, find the SPBRG value in both decimal and hexadecimal for each of the following baud rate [4]
 - i) 9600
 - ii) 4800

P.T.O.

Q4) Answer the following. [10]

- a) i) Find the output of logical operators in 'C' program code [2]
- 1) $0 \times 37 \& 0 \times CA$
- 2) $0 \times 04 | 0 \times 68$
- ii) Draw the interfacing diagram of LCD with PIC18, write PIC18 'C' program to display 'E' on LCD. [4]
- b) Write a PIC18 'C' program to convert ASCII digits of '3' and '7' to packed BCD and display it on PORT B. [4]

Q5) Write short notes on any four of the following. [4×2.5=10]

- a) Concept of pipelining.
- b) Serial port register (TXSTA)
- c) Timero control register (TOCOM)
- d) Features of PIC18.
- e) Interfacing LM35 with PIC18.
- f) Data memory of PIC18.



Total No. of Questions : 7]

SEAT No. :

PD3565

[Total No. of Pages : 2

[6484]-107

First Year M.Sc.

ELECTRONIC SCIENCE

STS-541-MJ: Research Methodology

(2023 Credit Pattern) (Semester - I) (Major Core)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Attempt any five questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.

Q1) Attempt any Five of the following.

[10]

- a) What is literature review?
- b) What is mean by presentation?
- c) Define verbal and non-verbal communication.
- d) Define curve fitting.
- e) What is mean by research methodology?
- f) What do you mean by questionnaire?

Q2) Attempt the following.

- a) Explain case study based with suitable points that how laboratory records maintain. **[7]**
- b) Write in brief ethical consideration in research. **[5]**

Q3) Attempt the following.

- a) Explain ancient Indian research methodology applications in brief. **[7]**
- b) What is mean by patent? Write details about patents in science and technology. **[5]**

Q4) Attempt the following.

- a) Write case study based note on selection of research topic. **[7]**
- b) Explain in brief Indian, Egyptian, Greek ideas methodologies. **[5]**

Q5) Attempt the following.

- a) What is mean by Thesis? Explain in brief various steps for writing thesis. **[7]**
- b) Describe and one identified research methods in brief. **[5]**

P.T.O.

Q6) Attempt the following.

- a) What is statistical analysis? Write its significance for research in brief.[7]
- b) Explain in brief exploratory and confirmatory research. [5]

Q7) Write short notes on any Two of the following. [12]

- a) Safety in Laboratories
- b) Field data collection
- c) History of research



Total No. of Questions : 7]

SEAT No. :

PD3566

[Total No. of Pages : 2

[6484]-201

M.Sc. -I

ELECTRONIC SCIENCE

**ELS 551-MJ: Modern Communication Systems
(2023 Credit Pattern) (Semester-II) (Credit - 4)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Attempt any 5 questions from Q.2 to Q.7.
- 3) Q.2 to Q.7 carry equal marks.

Q1) Answer any five of the following.

[10]

- a) State granular noise and slope overload.
- b) State the role of satellite in communication.
- c) Write the applications of turnstile antenna.
- d) State the features of V2V communication.
- e) What is hand-off in mobile communication?
- f) What is RZ and NRZ code?

Q2) Attempt the following.

- a) i) Explain the IEEE 802.11p wave standard. **[4]**
ii) Compare FSK and PSK. **[3]**
- b) Explain Yagi-Uda antenna using neat diagram. Write the applications of Yagi-Uda antenna. **[5]**

Q3) Attempt the following.

- a) i) Explain IEEE 802.15.7 standard. **[4]**
ii) Write the short note on parabolic reflector. **[3]**
- b) What is PPM and PWM? Compare PPM and PWM. **[5]**

P.T.O.

Q4) Attempt the following.

- a) i) Explain helical antenna using neat diagram and write its applications. [4]
- ii) Write note on hamming code. [3]
- b) Explain any two applications of satellite communication in detail. [5]

Q5) Attempt the following.

- a) i) Write the technical specifications and applications of IEEE 160g standard. [4]
- ii) Compare ASK and FSK. [3]
- b) Draw the architecture of Cellular phone system and explain it. [5]

Q6) Attempt the following.

- a) i) Explain: vehicular network and ITS. [4]
- ii) Write the short note on cell sertoning. [3]
- b) Explain delta modulation using neat block diagram. [5]

Q7) Attempt any two of the following.

- a) Explain VSAT network in detail. [6]
- b) Explain how 6G network used in collision avoidance. [6]
- c) Draw the block diagram of FSK modulator and explain it. Write its merits and demerits. [6]



Total No. of Questions : 7]

SEAT No. :

PD3567

[Total No. of Pages : 2

[6484]-202

M.Sc. (Part-I)

ELECTRONIC SCIENCE

ELS 552 MJ : Control System

(2023 Pattern) (Semester -II) (Credits System)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Question 1 is Compulsory.
- 2) Solve any five questions from Q.2 to Q.7.
- 3) Q.2 to Q.7 carry equal marks.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) Solve any five of the following.

[5×2=10]

- a) Determine the transfer Function of Low pass filter (RC).
- b) What is derivative over run?
- c) List the advantages of Frequency response analysis over the root Locus technique.
- d) Write working principle of control valves.
- e) What are the merits and demerits of AC servomotor?
- f) What is fuzzy logic controller?

Q2) Answer the following.

- a) For unity Feedback system $G(s) = \frac{k}{s(1 + 0.4s)(1 + 0.25s)}$, Find range of values of k, marginal values of k and frequency of sustained oscillations?
[7]
- b) Explain the application of control system in paper tension control system for winding.
[5]

Q3) Answer the following.

- a) Explain the concept of gain margin and phase margin. Explain how these values help in studying stability of Bode plot.
[7]
- b) Explain the concept of Block diagram of control system with suitable examples. State its advantages and limitations.
[5]

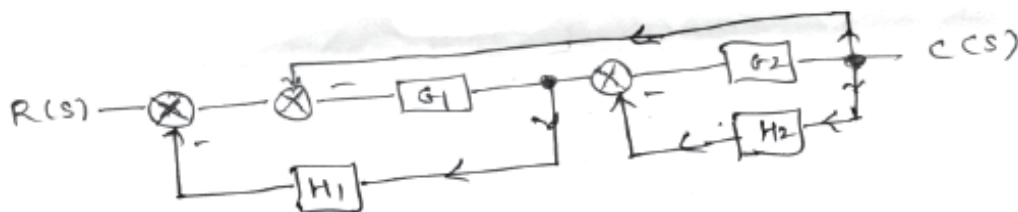
P.T.O.

Q4) Answer the following.

- a) An integral controller is used for temperature control in the range of 0 degree C to 250 degree C, with a set point 150 degree C. At zero-error the controller output is 20% reset rate is 0.1% second per % error if temp jumps to 180 degree C. calculate the controller output after 5 sec. [7]
- b) Draw the block diagram of open Loop Control System and explain it. [5]

Q5) Answer the following.

- a) Reduce the block diagram and obtain it's closed Loop Transfer Function $\frac{C(s)}{R(s)}$. [7]



- b) Find the stability of control system having characteristic equation $F(s) = s^4 + 10s^3 + 35s^2 + 50s + 24 = 0$ [5]

Q6) Answer the following.

- a) Explain the working of ON-OFF controller circuit. What is meant by differential gap? [7]
- b) What is actuator? List different types of actuators used in control system. [5]

Q7) Write short notes on any two of the following.

- a) Adaptive control system. [6]
- b) Synchro control transformer. [6]
- c) Annunciator. [6]



Total No. of Questions : 5]

SEAT No. :

PD3568

[Total No. of Pages : 2

[6484]-203

M.Sc. - I

ELECTRONIC SCIENCE

ELS-553-MJ: Industrial Automation

(2023 Credit Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*
- 4) *Neat diagram must drawn wherever necessary.*

Q1) Answer any Five of the following. [5]

- a) What is automation?
- b) List different automation tools used in process.
- c) State different modules of PLC.
- d) State classification of PLC based on size.
- e) List part of Ladder diagram.
- f) Draw Ladder diagram for AND gate.

Q2) Answer the following. [10]

- a) Design ladder Logic for the following automatic sequential control. [6]
 - i) Closing the switch S_1 should turn on the motors M_1 , M_2 , and M_3 immediately.
 - ii) When switch S_1 is opened, the motors M_1 , M_2 and M_3 should turn off with five second intervals.
- b) Explain different types of PLC programming methods. [4]

Q3) Answer the following. [10]

- a) Explain any four input field devices related to PLC based automation. [6]
- b) Design ladder logic for 4 to 1 multiplexer. [4]

Q4) Answer the following. [10]

- a) With the help of block diagram explain sourcing and sinking input and out put module. [6]
- b) Draw a ladder diagram for a box packaging system having the following conditions. Five boxes are stacked at a time and then bound with a wrapper. [4]

P.T.O.

Q5) Write short note on any Four of the following.

[10]

- a) Input module of PLC.
- b) Out put field devices.
- c) Up Counter.
- d) Off Timer (T_{off})
- e) Arithmetic instruction related to PLC.
- f) Sequencer.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PD3569

[6484]-204

M.Sc. - I

ELECTRONIC SCIENCE

**ELS 560 MJ: Instrumentation Systems and Applications
(2023 Pattern) (Credit System) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*

Q1) Solve any five of the following.

[5]

- a) Write the expanded form of ECG.
- b) Give the advantage of a Venturi meter over an orifice meter.
- c) What is the purpose of soil hygrometer?
- d) Name the sensor used for heart rate measurement.
- e) Which material is commonly used in RTDs?
- f) Name one sensor used in IoT based agriculture.

Q2) Attempt the following.

- a) With suitable diagram explain the working principle and selection criteria of thermocouples. **[6]**
- b) Explain why is an instrumentation amplifier required in low signal sensors. **[4]**

Q3) Attempt the following.

- a) Explain the concept of IoT - based health care system with a block diagram. **[6]**
- b) Justify the use of solid state pressure sensors over other pressure sensors. **[4]**

P.T.O.

Q4) Attempt the following.

- a) Discuss IoT - based agriculture system with suitable diagram. [6]
- b) Explain how RTD is more stable than thermistor. [4]

Q5) Write short note on any Four of the following. [10]

- a) Features of capacitive proximity sensors.
- b) Hall effect sensors.
- c) Use of dielectric soil moisture sensor.
- d) Working principle and features of load cell.
- e) Ultrasonic flow sensor - Working principle and Applications.
- f) Advantages of IoT in green house farming.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PD3570

[6484]-205

M.Sc. - I

ELECTRONIC SCIENCE

**ELS 561 MJ: Application of Artificial Intelligence and Machine Learning
(2023 Pattern) (Credit System) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.

Q1) Solve any five of the following.

[5]

- a) What is the purpose of rules of Inference?
- b) Define probabilistics reasoning.
- c) Represent the following in propositional logic. "If it rains, then the ground is wet.
- d) What is boosting in machine learning?
- e) Describe a simple temporal difference update equation.
- f) Define KD - Tree.

Q2) Attempt the following.

- a) Describe the types of uncertainty in AI and How they are handled? **[6]**
- b) What is the difference between & boosting in ensemble learning? **[4]**

Q3) Attempt the following.

- a) Explain the expectation-maximization algorithm used in probabilistics learning. **[6]**
- b) Calculate Euclidean distance between two data points: (2,3) and (6, 7).**[4]**

P.T.O.

Q4) Attempt the following.

a) Discuss how knowledge-based agents make decisions using Inference.[6]

b) Rule set: [4]

i) If fever THEN SICK

ii) If sick AND Tired then flu

Facts Given:- •Fever

•Tired

Determine the outcome using forward chaining.

Q5) Write short notes on any Four of the following. [12]

a) First order Logic

b) Nearest Neighbour

c) Model selection using information criteria

d) Sampling theory Basics

e) Estimators

f) Q-Learning Task



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PD3571

[6484]-206

M.Sc. - I

ELECTRONIC SCIENCE

ELS-562-MJ: Fundamentals and Applications of AVR

Microcontroller

(2023 NEP Pattern) (Semester - II) (Credit System)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Questions 2 to 5 carry equal marks.*

Q1) Answer any Five of the following. [5]

- a) Which pin on the LM35 sensor is used for the output voltage?
- b) Define program counter register.
- c) What is the role of UBRR register?
- d) State the function of RS pin of LCD.
- e) How many general-purpose registers (GPR) are in AVR32?
- f) Write the pin function of MISO and MOSI pins of AVR32.

Q2) Answer the following. [10]

- a) i) What are the features of the ADC in an AVR32? [2]
ii) Draw and explain interfacing diagram of stepper motor with AVR32, also write program code for rotate motor clockwise direction. [4]
- b) Draw and explain 8-bit status register of AVR32. [4]

Q3) Answer the following. [10]

- a) i) What is the use of DDRx register? [2]
ii) Write an AVR 'C' program to convert the 29 packed BCD number to ASCII numbers display it on port B and port C. [4]
- b) Draw and explain architecture block diagram of AVR32 microcontroller. [4]

P.T.O.

Q4) Answer the following. [10]

- a) i) List interrupt sources of AVR32 microcontroller. [2]
- ii) Write an AVR32 'C' Language program to get data from port B and send it port A continuously. [4]
- b) Explain data memory organization of AVR32 Microcontroller. [4]

Q5) Write short notes on any Four of the following. [4×2.5=10]

- a) Features of AVR32 Microcontroller.
- b) Concept of pipelining in AVR32 Microcontroller.
- c) The Logical operators used in AVR32 'C' programming.
- d) Steps to program Timero in normal mode.
- e) Reset sources of AVR32 microcontroller.
- f) RISC versus CISC.



Total No. of Questions : 7]

SEAT No. :

[Total No. of Pages : 2

PD3572

[6484]-301

M.Sc. (Part-II)

ELECTRONIC SCIENCE

ELS 601 MJ : Electromagnetics and Microwaves (EAM)

(2023 Credit Pattern) (Semester-III) (4 Credit) (NEP)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question No.1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Color pencils/pens other than red color are allowed to use.*
- 5) *Use of calculator is allowed.*

Q1) Solve any Five of the following.

[5×2=10]

- a) What is the frequency range and wavelength range of microwaves?
- b) Define: Electromagnetic wave.
- c) What is Gradient and curl?
- d) Define : Standing Wave Ratio (SWR)
- e) What is a single stub matching?
- f) With one example explain physical quantity as vectors.

Q2) Attempt the following.

[12]

a) i) What are:

[3]

1) Two-wire line

2) Coaxial cable

ii) Explain the operating principle for:

[4]

1) Optical fibers

2) Circular waveguides

b) What is hybrid coupler? Explain its applications.

[5]

P.T.O.

- Q3)** Attempt the following. [12]
- a) i) What is TE and TM mode in waveguides? [3]
 - ii) Write an equation for [4]
 - 1) Magnitude (r) and
 - 2) Angle (θ) for the polar form of a complex number.

How polar form of a complex number can be represented?
 - b) Explain with neat diagrams the concept of Bends and Twists. [5]
- Q4)** Attempt the following. [12]
- a) i) What are microstrip lines? [3]
 - ii) Explain phase velocity. [4]
 - b) Write a note on Smith chart. [5]
- Q5)** Attempt the following. [12]
- a) i) Explain Rectangular waveguides [3]
 - ii) Write a note on cylindrical magnetron. [4]
 - b) Explain construction and working of Tunnel (Esaki) Diode. [5]
- Q6)** Attempt the following. [12]
- a) i) Define: [3]
 - 1) Line Impedance
 - 2) Normalized Impedance
 - 3) Admittance
 - ii) Give the importance of [4]
 - 1) Reflection coefficients
 - 2) Transmission coefficients
 - b) Explain Klystron in details. [5]
- Q7)** Write a short notes any two of following. [2×6=12]
- a) Applications of microwaves.
 - b) Helix and coupled cavity TWT.
 - c) Maxwell's equations with its physical meaning.



Total No. of Questions : 7]

SEAT No. :

PD3573

[Total No. of Pages : 2

[6484]-302

M.Sc. - II

ELECTRONIC SCIENCE

**ELS 602 MJ: Foundation of Semiconductor Devices
(NEP 2023 Credit Pattern) (Semester - III) (Credit 4)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Solve any five questions from Q.2 to Q.7.*
- 3) *Question 2 to 7 carry equal marks.*

Q1) Solve any five of the following:

[10]

- a) Define mass action Law.
- b) "BJT is a bipolar device" comment.
- c) What is pinch off condition in JFET?
- d) Define doping.
- e) List the types of basic crystal structure.
- f) What are the different types of IC'S?

Q2) Answer the following.

- a) Draw a band structure of metal, semiconductor & Insulator at 0 °K and explain the difference between them. **[7]**
- b) Explain carrier generation & Recombination process in semiconductor material. **[5]**

Q3) Answer the following.

- a) What is breakdown in diode? What are the types? Explain any one in details. **[7]**
- b) Explain working of Intrinsic layer of PIN Diode operation. **[5]**

Q4) Answer the following.

- a) What is effect of substrate bias in MOSFET? **[7]**
- b) Discuss ideal IV characteristics of JFET. Explain pinch of voltage & ohmic region. **[5]**

P.T.O.

Q5) Answer the following.

- a) What do you mean by FPGA? Explain its working with neat block diagram. [7]
- b) What are the types of SPLD's? Explain it with block diagram. [5]

Q6) Answer the following.

- a) Explain working principle of tunnel diode with suitable diagram and IV characteristics. [7]
- b) Explain Eber-Moll model for NPN BJT. [5]

Q7) Answer the following. (Any two) [12]

- a) Explain the working of MOSFET with help of suitable diagram.
- b) Write a note on Low frequency small signal two port network of BJT.
- c) Write a note on types of semiconductors.



Total No. of Questions : 5]

SEAT No. :

PD3574

[Total No. of Pages : 2

[6484]-303

M.Sc. - II

ELECTRONIC SCIENCE

ELS-603-MJ : Advanced Industrial Electronics

(2023 Credit Pattern) (Semester-III) (Credits-2) (NEP 2020)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Answer any 3 questions from Q2 to Q5.*
- 3) *Q.2 to Q.5 Carry Equal Marks.*

Q1) Solve any Five of the following :

[5×1=5]

- a) What is GTO? Draw its symbol.
- b) List advantages of IGBT
- c) What is Latching current of SCR?
- d) What is chopper?
- e) Define : Intrinsic stand-off ratio of UJT.
- f) List applications of DIAC.

Q2) Answer the following.

- a) Differentiate between SCR and TRIAC. **[4]**
- b) Explain I-V characteristics of UJT in details. **[4]**
- c) List any four solid state switching devices. **[2]**

Q3) Answer the following.

- a) Explain working principle of BJT in details with neat labelled diagram. **[4]**
- b) What is actuator ? Explain any one actuator in details. **[4]**
- c) List any four applications of choppers. **[2]**

P.T.O.

Q4) Answer the following.

- a) Differentiate between single phase and three phase power supply. [4]
- b) Explain AC-DC current converters in details with neat labelled diagram.[4]
- c) Draw circuit symbols of MOSFET. [2]

Q5) Write short notes on (Any Four)

[4×2.5=10]

- a) What is dv/dt triggering?
- b) Explain gate triggering circuit?
- c) AC - AC current convertors.
- d) General block diagram of thyristor.
- e) IGCT
- f) PUT



Total No. of Questions : 5]

SEAT No. :

PD3575

[Total No. of Pages : 2

[6484]-304

M.Sc. - II

ELECTRONIC SCIENCE

**ELS 610 MJ : Fundamentals of Electric Vehicle Technology (FEVT)
(2023 Credit Pattern) (Semester - III) (Credit - 2) (Major Elective)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.*
- 2) Solve any three questions from Q.2 to Q.5.*
- 3) Q.2 to Q.5 carry equal marks.*
- 4) Color pencils/pens other than red color are allowed to use.*
- 5) Neat diagrams must be drawn whenever necessary.*

Q1) Solve any five of the following. [5]

- a) Define HEV.
- b) What is the unit of electrical energy consumption?
- c) What is mean by power flow control?
- d) Name any two types of current converters?
- e) What is the role of Ultra - Capacitors?
- f) What is the role of Battery swapping station?

Q2) Answer the following. [10]

- a) i) Give any two reasons behind use of EV. [2]
- ii) Explain four quadrants of DC Chopper operation. [4]
- b) Distinguish between hard switching and soft switching converters. [4]

Q3) Answer the following. [10]

- a) i) Mention two types of battery chargers. [2]
- ii) Name and explain any four types of batteries. [4]
- b) Explain two types of battery charging infrastructure. [4]

P.T.O.

Q4) Answer the following. [10]

- a) i) What is inductive charging? [2]
ii) Differentiate between fast charging and normal charging station. [4]
- b) Explain the working principle of BLDC motor in an EV. [4]

Q5) Write a short note on any four of the following. [10]

- a) Wireless charging technology
- b) HEV system performance
- c) Public charging infrastructure
- d) Challenges of EVs.
- e) Microprocessor - based charger circuit
- f) Move and charge zone



Total No. of Questions : 5]

SEAT No. :

PD3576

[Total No. of Pages : 2

[6484]-305

M.Sc. - II

ELECTRONIC SCIENCE

**ELS 611 MJ : Fundamentals and Applications of Raspberry Pi
Using Python**

(2023 Credit Pattern) (Semester - III) (Credit - 2) (Theory)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Solve any three questions from Q.2 to Q.5.*
- 3) *Question 2 to 5 carry equal marks.*
- 4) *Neat diagrams must be drawn whenever necessary.*

Q1) Attempt any five of the following.

[5]

- a) Which processor is used in Raspberry Pi?
- b) How physical numbering scheme is selected on Raspberry Pi?
- c) What is SOC?
- d) State the use of 'GPIO.Cleanup()' function.
- e) List any two standard data types in python.
- f) State use of HDMI port in Raspberry Pi.

Q2) Answer the following.

[10]

- a)
 - i) Write a python program for LED interfacing to Raspberry Pi. [2]
 - ii) With neat block diagram explain Single Board Computer (SBC).[4]
- b) What are standard datatypes in python? Explain any three in details? [4]

P.T.O.

Q3) Answer the following. [10]

- a) i) State the advantages and disadvantages of SBC. [2]
- ii) Write the functions of following blocks of Raspberry Pi. [4]
 - 1) Micro SD Card
 - 2) USB ports
 - 3) Ethernet
 - 4) Processor
- b) Draw the neat diagram of architecture of SOC? Explain any three blocks of it. [4]

Q4) Answer the following. [10]

- a) i) Give features of Raspberry Pi. [2]
- ii) Explain the interfacing of switch to Raspberry Pi with help of neat diagram & write python program for same. [4]
- b) List different types of operators used in python. Explain any three operators in detail. [4]

Q5) Write short note on any four of the following. [10]

- a) Network access devices.
- b) Elif statement in python.
- c) Arm 11 processor.
- d) Beagle - Bone Black
- e) Library functions in python.
- f) Write a python program for division of two numbers.



Total No. of Questions : 5]

SEAT No. :

PD3577

[Total No. of Pages : 2

[6484]-307

M.Sc. - II

ELECTRONIC SCIENCE

ELS 613 MJ : Nanotechnology

(NEP 2023 Credit Pattern) (Semester - III) (Credit - 2)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Attempt any three questions from Q.2 to Q.5.
- 3) Q.2 to Q.5 carry equal marks.

Q1) Attempt any five of the following. [5]

- a) Define clusture.
- b) Draw the band structure for insulator.
- c) List any two analysis techniques to analyze nanomaterials.
- d) What are sols?
- e) Mention the range of wavelength over which photoelectron spectroscopy work.
- f) State Beer Lambert Law.

Q2) Attempt the following.

- a) What is sputtering? Explain DC sputtering. [5]
- b) Discuss the use of nanomaterials in defense and Engineering. [5]

Q3) Attempt the following.

- a) Illustrate the role of UV vi spectroscopy technique in nanomaterial. [5]
- b) Explain chemical bath in synthesis of nanomaterial. [5]

P.T.O.

Q4) Attempt the following.

- a) Describe MBE in detail. [5]
- b) Write the uses of nanomaterials in Agri and food industry. [5]

Q5) Attempt any four of the following. [10]

- a) Illustrate the meaning of phonon.
- b) Write steps involved in sol-gel method.
- c) How the nanotechnology used in cancer therapy.
- d) Describe the components of Raman spectroscopy.
- e) Explain IR spectrometer that uses Michelson interferometer.
- f) Explain electroluminescence property of nanomaterials.



Total No. of Questions : 7]

SEAT No. :

PD3578

[Total No. of Pages : 2

[6484]-401

M.Sc. -II

ELECTRONIC SCIENCE

**ELS 651-MJ: Advanced Embedded System Design
(2023 Credit Pattern) (Semester-IV) (NEP) (Credit-4)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any 5 questions from Q.2 to Q.7.*
- 3) *Q.2 to Q.7 carries equal marks.*
- 4) *Neat diagram must be drawn whenever necessary.*

Q1) Answer any five of the following.

[10]

- a) What is arm cortex M3 processor?
- b) What is the role of nested vector Interrupt controller in arm cortex M3 processor?
- c) Define operating system?
- d) What is thread in OS?
- e) What is the function of pipeline in arm cortex M3?
- f) What is the system call? Give one example in OS?

Q2) Answer the following.

- a)
 - i) Explain background of arm processor and its types? **[2]**
 - ii) Describe the advanced system behaviour and programming feature of the ARM cortex M3 processor? **[5]**
- b) Draw block diagram of arm cortex M3 processor and explain each block? **[5]**

Q3) Answer the following.

- a)
 - i) Mention any two difference between operating system and firmware? **[2]**
 - ii) Explain memory management in an operating system discuss segmentation? **[5]**
- b) Differentiate between multiprocessing and multitasking? **[5]**

P.T.O.

Q4) Answer the following.

- a) i) Explain the concept of pin connect block in LPC 176X? [2]
- ii) What are the main task of memory management in operating system? [5]
- b) Explain in detail the various input/output devices in LPC 176X such as CAM, SPI, I2C? [5]

Q5) Answer the following.

- a) i) List two difference between process and thread? [2]
- ii) Discuss the importance of debugging component in the cortex M3 processor architecture? [5]
- b) Explain different type of operating system with example, focusing on real time operating system? [5]

Q6) Answer the following.

- a) i) What are the general type of registers present in ARM cortex M3 processor? [2]
- ii) Describe the BIOS action during boot process in detail? [5]
- b) Explain the concept of interrupt behaviour in arm cortex M3? How does processor handle interrupt? [5]

Q7) Answer the following. (Any two)

- a) Describe the exception programming in ARM cortex M3 processor? Provide the examples of exception handling. [6]
- b) Describe the architecture of nested vector interrupt controller? [6]
- c) Write down the difference between RTOS and general purpose operating system? [6]



Total No. of Questions : 7]

SEAT No. :

PD3579

[Total No. of Pages : 2

[6484]-402

M.Sc. (Part-II)

ELECTRONIC SCIENCE

ELS -652- MJ : Robotics and Mechatronics

(2023 Credit Pattern) (Semester -IV) (NEP)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is Compulsory.*
- 2) *Solve any five questions from Q2 to Q7.*
- 3) *Figures to the right indicate full marks.*
- 4) *Color pencils/pens other than red are allowed to be used for diagrams.*
- 5) *Draw neat diagram whenever necessary.*
- 6) *Use of Calculator is allowed.*

Q1) Solve any five of the following.

[5×2=10]

- a) What is mean by Robotics?
- b) Define mechatronic systems.
- c) Define
 - i) Line motion
 - ii) Circular motion
- d) Why feedback control systems are needed?
- e) Name any four sensors use in robot.
- f) Define
 - i) AC motor
 - ii) DC motor

Q2) Attempt the following

- a)
 - i) Explain different types of Relays **[3]**
 - ii) Explain the role of trajectory generation for robotic motion **[4]**
- b) Write a note on Robot Controller **[5]**

P.T.O.

Q3) Attempt the following.

- a) i) Explain applications of Robots in smart city management with examples [3]
- ii) Write a note on Nano Robots [4]
- b) Explain Protective measures in Relay Driver Circuits. [5]

Q4) Attempt the following.

- a) i) Explain sensors and transducers in brief. [3]
- ii) Write a note on beamings and its applications [4]
- b) Write a note on Accuracy and Repeatability of Robotics Design [5]

Q5) Attempt the following.

- a) i) Explain ball screw [3]
- ii) Explain belt and chain drives [4]
- b) Write a note on Robot work space. [5]

Q6) Attempt the following.

- a) i) Explain Cams and Gears [3]
- ii) Explain Relays with driver circuits [4]
- b) Explain classification of Robots [5]

Q7) Write a short notes on any two of the following. [2×6=12]

- a) Kinematic chains
- b) Role of A. I. in Robotics.
- c) Future of Domestic Robot.



Total No. of Questions : 5]

SEAT No. :

[Total No. of Pages : 2

PD3580

[6484]-403

M.Sc. (Part-II)

ELECTRONIC SCIENCE

**ELS 660 MJ : Advanced Electric Vehicle Technology (AEVT)
(2023 Credit Pattern) (NEP) (Semester-IV) (Credit-2)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory*
- 2) Solve any THREE questions from Q. 2 to Q 5.*
- 3) Figure to the right indicate full marks.*
- 4) Color pencils/pens other than red are allowed to be used for diagrams.*
- 5) Draw neat diagram whenever necessary.*
- 6) Use of Calculator is allowed.*

Q1) Solve any Five of following.

[5]

- a) Define Electric Vehicle (EV).
- b) Why Inductive charging is use?
- c) What is mean by HEV?
- d) Define power flow control.
- e) What is soft switching in inverters?
- f) Define Energy consumption.

Q2) Answer the following.

[10]

- a) i) Give any two reasons behind use of ultra-capacitors. **[2]**
- ii) Explain Domestic charging infrastructure. **[4]**
- b) Write a note on move and charge zone and its importance. **[4]**

P.T.O.

Q3) Answer the following. [10]

- a) i) Name any two types of Battery chargers. [2]
- ii) Write a note on Fast Charging Station's working. [4]
- b) Explain public charging infrastructure. [4]

Q4) Answer the following. [10]

- a) i) Explain normal charging station. [2]
- ii) What are configurations of HEV. [4]
- b) Write a note on battery characteristics while charging and discharging. [4]

Q5) Write a short note (any four) [4×2.5=10]

- a) Advantages of EVs.
- b) DC-DC converter in an EV.
- c) EV with power of Artificial Intelligence (AI).
- d) Performance of Electric Vehicle.
- e) Working of Internal Combustion Engine (ICE)
- f) Wireless Charging Technology.



Total No. of Questions : 5]

SEAT No. :

PD3581

[Total No. of Pages : 2

[6484]-404

M.Sc. - II

ELECTRONIC SCIENCE

ELS-661-MJ : Internet of Things

(NEP 2023 Credit Pattern) (Semester - IV) (Credit - 2)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.
- 4) Neat diagram must be drawn whenever necessary.

Q1) Answer any five of the following.

[5]

- a) Define the term “Internet of things”.
- b) What are different types of RFID Tags?
- c) What does “e-Health” in IoT refer to?
- d) Define “Scalability” in context of IoT.
- e) What is mean by “smart metering” in IoT application?
- f) Name one security challenge in IoT.

Q2) Answer the following.

- a) i) What is main purpose of “smart metering” in IoT system? **[2]**
ii) Explain the working principle and components of RFID system. **[4]**
- b) Explain the concept of “Tracking” in IoT and its use in mobile object. **[4]**

Q3) Answer the following.

- a) i) What is significance of satellite technology in IoT system. **[2]**
ii) Define IoT frameworks and discuss any one Framework in detail. **[4]**
- b) Discuss the importance of “Communication capabilities” in IoT system. **[4]**

P.T.O.

Q4) Answer the following.

- a) i) Explain any two challenges for secure IoTs. [2]
- ii) Discuss the role of satellite technology in the functioning and expansion in IoT system. [4]
- b) Discuss the application of IoT in “Home automation” and how IoT enhances home automatic application and its safety. [4]

Q5) Attempt any four of the following. [4×2½=10]

- a) Describe the key components of RFID.
- b) What are the key difference between traditional metering system and smart metering system.
- c) Describe the concept of “City Automation” in the context of IoT application.
- d) Explain the role of sensors in IoT systems.
- e) Explain any three challenges for secure IoT.
- f) Discuss the ITU-T views in IoT.



Total No. of Questions : 5]

SEAT No. :

PD3582

[Total No. of Pages : 2

[6484]-405

M.Sc.(Part-II)

ELECTRONIC SCIENCE

ELS-662-MJ : Digital Image Processing

(2023 Credit Pattern) (Semester - IV)(NEP) (Credit 2)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.
- 4) Draw neat diagram wherever necessary.

Q1) Answer any five of the following. [5]

- a) Name two types of light receptors.
- b) In RGB model which color appears at the origin?
- c) Define image.
- d) Mention the factors which determine the quality of a digital image.
- e) Give the common method for decreasing aliasing effects an image.
- f) Write the major objectives of image enhancement technique.

Q2) Answer the following.

- a) i) What is Hue and saturation? [2]
- ii) Illustrate the various components of an image processing system.[4]
- b) Write a short note on edge detection. [4]

Q3) Answer the following.

- a) i) What is the boundary of a pixel? [2]
- ii) Write a short note on Hough transform. [4]
- b) Explain image acquisition using single sensor. [4]

P.T.O.

Q4) Answer the following.

- a) i) What is image filtering? [2]
- ii) Explain the method of filtering an image in frequency domain with the help of flow chart. [4]
- b) Explain basic highpass filtering for sharpening the image. [4]

Q5) Answer any four of the following. [10]

- a) What is image sampling?
- b) Explain line detection technique in image segmentation.
- c) Compare enhancement and restoration technique.
- d) Write the meaning of color model. Mention the color appear at the origin of color model.
- e) Write the need of transform.
- f) Mention how the image pyramid involved in the representation of an image.



Total No. of Questions : 5]

SEAT No. :

PD3583

[Total No. of Pages : 2

[6484]-406

M.Sc. - II

ELECTRONIC SCIENCE

**ELS-663-MJ : Integrated Circuit (IC) Technology and VLSI
(2023 Credit Pattern) (Semester - IV) (Credit - 2) (Major Elective Theory)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Question 1 is compulsory.
- 2) Solve any three questions from Q.2 to Q.5.
- 3) Question 2 to 5 carry equal marks.
- 4) Neat diagrams must be drawn wherever necessary.

Q1) Answer any five of the following. [5]

- a) Differentiate between PMOS and NMOS transistors.
- b) State advantages of VLSI technology.
- c) Draw circuit diagram of CMOS inverter.
- d) What is primary goal of water fabrication?
- e) Name two thin film deposition methods.
- f) Differentiate between dry etching and wet etching.

Q2) Answer the following.

- a) i) Explain the operation of 2-input CMOS NAND gate with neat circuit diagram. [3]
ii) What is stick diagram? Explain various symbols used for component in stick diagram. [3]
- b) Outline the major steps involved in the nMOS fabrication process. [4]

Q3) Answer the following.

- a) i) Explain chemical bath deposition (CBD) method. [3]
ii) Explain photolithography process used in IC fabrication. [3]
- b) Explain the working principle of four probe method for resistivity measurement. [4]

P.T.O.

Q4) Answer the following.

a) Explain the features and capabilities of magic VLSI layout tool and electric VLSI design system layout tools. [6]

b) Explain lambda based design rules. [4]

Q5) Write short notes on any four of the following. [10]

a) BiCMOS technology.

b) Pass transistors.

c) Contact cuts in layout Design.

d) Spin coating.

e) Metallization

f) Chemical vapour deposition

