

[6344]-1001

M.Sc.

ELECTRONIC SCIENCE

ELS - 501 MJ : Analog System Design

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

Time : 3 Hours]

[Max. Marks : 70

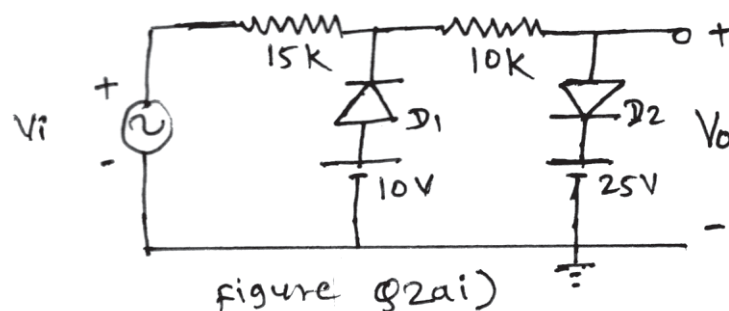
Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Solve any Five questions from Q.2 to Q.7.
- 3) Questions 2 to 7 carry equal marks.
- 4) Neat diagrams must draw wherever necessary.

Q1) Solve any Five of the following :**[10]**

- a) Why Colpitt Oscillator are used to genera fixed radio frequency signal?
- b) Draw hybrid equivalent circuit of common base configuration.
- c) A Hartley oscillator is design to generate a high frequency signal. If $L_1 = 1 \text{ mH}$, $L_2 = 0.2 \text{ mH}$ and $C = 200 \text{ pF}$ Find the value of f generated.
- d) Sketch transfer characteristics of an op-amp.
- e) List different types of transistorized biasing methods.
- f) What are the advantages of h parameters?

Q2) a) i) For the circuit shown in following Figure, a sinusoidal input $V = 50 \sin \omega t$ is applied as input plot input output waveform. **[4]**



- ii) How amplifiers are classified? Explain with suitable examples of each. **[3]**

P.T.O.

- b) Explain the working of Butterworth second order low pass filter. Design second order low pass filter for following specification. [5]
- pass band voltage gain = 2
 - cut-off Frequency $F_c = 10 \text{ kHz}$
- Q3) a) i)** Explain following parameters of op-amp and their significance in design of op-amp circuits. [4]
- CMRR
 - V_{io} (input offset Voltage)
 - Slew rate
 - Full power band width
- ii) Explain the working of n channel MOSFET in depletion mode. [3]
- b) What is tuned amplifier? Distinguish between double tuned and stagger tuned amplifier. [5]
- Q4) a) i)** Explain different types of distortions in amplifiers. [4]
- ii) Show how you would use a single op-amp to generate the relationship.
- $$e = \int_0^t (e_1 + 3e_2 + 6e_3) dt$$
- Find component values if the integrating capacitor has a value of $1\mu\text{f}$. (Assume ideal op-amp) [3]
- b) What are the advantages of FET over bipolar junction transistor? Explain how depletion layer is formed in FET. [5]
- Q5) a) i)** Draw a net circuit diagram for Wein bridge oscillator using BJT. Design it for frequency 10kHz . [4]
- ii) The common base dc current gain of transistor is 0.967. If the emitter current is 10 mA . What is the value of base current. [3]
- b) Draw ac equivalent circuit of CE amplifier with voltage divider bias using h parameter model and derive the equation for voltage gain and current gain. [5]

- Q6)** a) i) Obtain expression for output voltage and voltage gain of non inverting op-amp in closed loop configuration. [4]
ii) What type of coupling scheme would you use for amplifying a signal obtained from thermocouple to measure temperature of furnace? Give reason. [3]
b) The crystal has $L = 0.5\text{H}$, $C_s = 0.06\text{ pF}$, $C_p = 1\text{pF}$ and $R = 5\text{k}$ parameters. Find series and parallel resonant frequencies and Q Factor of the crystal. [5]

Q7) Write short note on any two of the following :

- a) i) Diode in clamper circuit. [3]
ii) Frequency response of single stage RC coupled CE amplifier. [3]
b) i) Frequency compensation of an op-amp [3]
ii) Capacitances across p-n junction. [3]
c) i) Open loop configuration of an op-amp. [3]
ii) Square wave testing in amplifiers. [3]



Total No. of Questions : 7]

SEAT No. :

PC-4305

[Total No. of Pages : 2

[6344]-1002
M.Sc - I
ELECTRONIC SCIENCE
ELS502MJ : Advanced Digital System Design Using
Verilog
(2023 Pattern) (Semester - I) (Credit - 4) (NEP)

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 is programmable AND and oR arrey?
- b) State the features of SPLD.
- c) Write the advantages of HDLs in digital systems.
- d) Write the comment on testbench.
- e) Compare parity generator and parity checker.
- f) What is combinational and sequential circuits.

Q2) Attempt the following :

- a)
 - i) Draw the block diagram of CPLD and explain it. **[4]**
 - ii) Compare SRAM and DRAM. **[3]**
- b) Explain the blocking and non-blocking assignment in verilog **[5]**

Q3) Attempt the following :

- a)
 - i) Design 3- bit synchronous counter. **[4]**
 - ii) Comment : periodic refreshing is required in DRAM **[3]**
- b) Draw the design flow diagram of digital circuit and explain it. **[5]**

P.T.O.

Q4) Attempt the following :

- a) i) What is PLA? Implement the logic function
 $F(A,B,C) = (0,1,3,4)$ using PLA. [4]
- ii) Explain \$ monitor, \$ display and \$ stop in verilog. [3]
- b) Design the full adder circuit - and draw its logic diagram. [5]

Q5) Attempt the following :

- a) i) Explain priority encoder using neat diagram. [4]
- ii) Draw the DRAM cell and explain it. [3]
- b) What is State diagram of J - K, S-R and D - Flip Flop. [5]

Q6) Attempt the following :

- a) i) Explain 6 - transistor SRAM cell using neat diagram [4]
- ii) Write short note on 4- bit universal shift register. [3]
- b) Draw the logic diagram of one digital BCD adder and explain it. [5]

Q7) Attempt any two of the following :

- a) What is gate level modelling? Write the verilog code for 4 : 1 multiplexer using gate level modeling. [6]
- b) What is multiplexed display system? Write its advantages. Draw the 4- bit multiplexed display system logic diagram. [6]
- c) Explain 4-bit look ahead carry generator. [6]



Total No. of Questions : 5]

SEAT No. :

PC-4306

[Total No. of Pages : 2

[6344]-1003

M.Sc. (Electronic Science)

ELS503MJ: MATHEMATICAL METHODS IN ELECTRONICS

(2023 Pattern) (Semester - I) (Paper - III) (2 - Credits)

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 Five of the following:

[5]

- a) Define a unit ramp function.
- b) Give the syntax of command to find square root of a function.
- c) What clear all command will do in MATLAB.
- d) Define signal.
- e) Write a MATLAB command to find poles & zeros.
- f) What is mean by periodic signal.

Q2) Answer the following:

- a) i) Explain the linearity property of Laplace transform. **[2]**
- ii) What are the advantages of digital filter over analog filter? **[4]**
- b) Find out the Laplace transform of $f(t) = e^{-2t} + 4e^{-3t}$ **[4]**

P.T.O.

Q3) Answer the following:

- a) i) Write a MATLAB program to plot $\cos(x)$ function. [2]
- ii) Find out the current flowing through series RC networks using Laplace transform. [4]
- b) Explain different classifications of signal. [4]

Q4) Answer the following:

- a) i) What are the limitations of Fourier series? [2]
- ii) Write a MATLAB code to find out the roots of polynomial $f(x) = x^2 + 10x + 8$ [4]
- b) Find inverse Laplace transform of $F(s) = \frac{2s+5}{s^2+5s+6}$ [4]

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

- a) List any five properties of z-transform.
- b) Define sampling theorem and explain it.
- c) Explain the following command in MATLAB
 - i) x axis
 - ii) y axis
 - iii) title
- d) Calculate the periodicity of $x(t) = e^{j100\pi t}$.
- e) What do you mean by ROC?
- f) Write a MATLAB code to find an inverse Laplace transform of $F(s) = \frac{1}{s+4} + \frac{3}{s+7}$



Total No. of Questions : 5]

SEAT No. :

PC-4307

[Total No. of Pages : 2

[6344]-1004

M.Sc. (Part - I) (Electronic Science)

**ELS510MJ : FUNDAMENTALS OF INSTRUMENTATION
SYSTEM**

(2023 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) What is accuracy?
- b) State advantages of Electronic Instruments.
- c) Write applications of DSO.
- d) Give the names of measuring instruments for power measurement.
- e) What are international standards?
- f) A thermometer is calibrated 150°C to 200°C. The accuracy is specified within $\pm 0.25\%$ of instrument span. What is the maximum static error?

Q2) Answer the following :

- a) Describe the cathode ray oscilloscope with reference to specifications and performance parameters. **[6]**
- b) Explain any two methods to reduce the effects of interfering and modifying inputs. **[4]**

P.T.O.

Q3) Answer the following :

- a) With the help of block diagram explain each element of measurement system in detail. [6]
- b) Discuss the measures taken to reduce environmental errors. [4]

Q4) Answer the following :

- a) Describe the factors taken into consideration while designing and constructing standard inductors. [6]
- b) A circuit was tuned for response by eight different students and the value of resonant frequency in KHz. were recorded as 532, 548, 543, 535, 546, 531, 543, 536. [4]

Calculate:

- i) Arithmetic mean
- ii) Deviation from mean
- iii) The average deviation

Q5) Write the short notes on any Four of the following : [10]

- a) Primary standards of Luminous Intensity.
- b) Instrument Errors.
- c) Spectrum Analyzer.
- d) Electrodynamometer Wattmeter.
- e) Resistance standards.
- f) Null type instrument.



Total No. of Questions : 5]

SEAT No. :

PC-4308

[Total No. of Pages : 2

[6344] - 1005

M.Sc. (Electronic Science)

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

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

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 diagrams must be drawn whenever necessary.*

Q1) Solve any Five of the following :

[5 × 1 = 5]

- a) What is the decision trees?
- b) Discuss the role of Agent in problem
- c) Define linear Regression
- d) List down characteristics of intelligent agent.
- e) What is the significance of classification?
- f) State on which basis search algorithm are chosen

Q2) Answer the following :

- a) How a problem is formally defined? List down the component of it. **[6]**
- b) Explain how classification & regression trees work **[4]**

P.T.O.

Q3) Answer the following :

- a) Discuss working of unsupervised learning write advantages & disadvantages of unsupervised learning. [6]
- b) Explain the A* search. and give the proof of optimality of A* [4]

Q4) Answer the following :

- a) Discuss artificial intelligence and machine learning with suitable example. [6]
- b) Define version spaces Explain various algorithm associated with it [4]

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

- a) Best first search
- b) PAC learning
- c) K-nearest Neighbour
- d) Geometric models.
- e) Concept of rationality
- f) Multilayer perception



Total No. of Questions : 5]

SEAT No. :

PC-4309

[Total No. of Pages : 2

[6344]-1006

M.Sc. - I (Electronic Science)

**ELS512MJ: FUNDAMENTALS AND APPLICATIONS OF
PIC MICRO CONTROLLER**

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

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) Attempt any Five of the following:

[5]

- a) To which register does the BRGH bit belong?
- b) Upon power-on reset, what address in the interrupt vector table is assigned to the high-priority interrupt?
- c) Give two factors that affect the step size calculation in ADC.
- d) Find the hexa decimal code to display 'g' on common cathode seven segment display?
- e) State the function of stack pointer (sp) and program counter (pc) registers.
- f) What is step angle for stepper motor, if 200 steps required for one rotation?

Q2) Answer the following:

- a) i) Find the ROM memory address for **[2]**
A) PIC18 with 4KB B) PIC18 with 16KB
- ii) Write a C program for PIC18 to send value 00-FFH to PORTB. **[4]**
- b) Draw a block diagram to interface the DC motor with PIC18 micro controller and write 'C' program to rotate motor clockwise direction. **[4]**

P.T.O.

Q3) Answer the following:

- a) i) Find the output of shift operators in 'C' program code: [2]
A) 0X 9A >> 3 and B) 0X79 >> 4
- ii) What is RISC architecture? Write the features of RISC architecture. [4]
- b) Draw a block diagram to interface DAC with PIC18 microcontroller. Write 'C' program code to generate square wave output. [4]

Q4) Answer the following:

- a) i) Write any four features of PIC18 microcontroller. [2]
- ii) List interrupt sources of PIC18 microcontroller. [4]
- b) Write a 'C' program for PIC18 to convert 1111101 (FD), to decimal and display the digit on PORTB, PORTC and PORTD. [4]

Q5) Write short notes on any Four of the following: [4× 2½ = 10]

- a) Format of TXSTA (Transmit status and control register)
- b) Status register of the PIC18 microcontroller.
- c) Interfacing block diagram of LM35 with PIC18 microcontroller.
- d) Steps to program 8-bit mode of Timer0.
- e) Logical operators in C program for PIC18.
- f) Concept of pipelining in PIC18.



Total No. of Questions : 7]

SEAT No. :

PC-4310

[Total No. of Pages : 2

[6344]-1007
M.Sc. (Part - I)
ELECTRONIC SCIENCE
STS-541MJ : Research Methodology
(NEP 2020) (2023 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) Q.2 to Q.7 carry equal marks.

Q1) Attempt any five of the following : **[10]**

- a) What do you mean by questionnaire?
- b) Define the term patent.
- c) What is research methodology?
- d) What do you mean by presentation?
- e) Define error and noise analysis ?
- f) What is research paper?

Q2) Attempt the following :

- a) Explain Case study based with suitable points that how laboratory records maintain. **[7]**
- b) Explain with the help of suitable point effective verbal and nonverbal communication. **[5]**

Q3) Attempt the following :

- a) Explain ancient Indian research methodology applications in brief. **[7]**
- b) Write in brief field data collection in research. **[5]**

P.T.O.

Q4) Attempt the following :

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

Q5) Attempt the following :

- a) Write case study based note on selection of research topic. [7]
- b) Explain in brief exploratory and confirmatory research. [5]

Q6) Attempt the following :

- a) What is statistical analysis? Write its significance for research in brief.[7]
- b) Explain in brief Indian, Egyptian, Greek ideas methodologies. [5]

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

- a) Safety in laboratories.
- b) Research proposal
- c) History of research.



Total No. of Questions : 7]

SEAT No. :

PC-4311

[Total No. of Pages : 2

[6344]-2001

M.Sc - I

ELECTRONIC SCIENCE

ELS 551 MJ : Modern Communication Systems

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

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) Answer 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) State the key features of 6G Network.
- b) Write the applications of satellite communication.
- c) What is baseband transmission? Write its example.
- d) Define: Granular noise and slope overload distortion.
- e) Compare isotropic antenna and directional antenna.
- f) State the applications of turnstile antenna.

Q2) Attempt the following :

- a) i) Explain any four antenna parameters. **[4]**
ii) Write a short note on horn antenna. **[3]**
- b) Describe pulse position modulation and pulse width modulation in short. **[5]**

Q3) Attempt the following :

- a) i) Write the technical specifications and applications of IEEE802.15.7 standard. **[4]**
ii) Write the short note on helical antenna. **[3]**
- b) Compare FSK and PSK. Why bit rate and band rate is same in FSK?**[5]**

P.T.O.

Q4) Attempt the following :

- a) i) Explain Yagi-Uda antenna using neat diagram. [4]
- ii) Write a short note on hamming code. [3]
- b) Explain the applications of satellite communication with example. [5]

Q5) Attempt the following :

- a) i) Explain the cellular phone system using neat diagram. [4]
- ii) Write a short note on radiation from an oscillating dipole. [3]
- b) Explain IEEE1609 standard. Write its applications. [5]

Q6) Attempt the following :

- a) i) Explain lens antenna and its applications. [4]
- ii) Explain the techniques used to enhance the channel capacity of cellular phone system. [3]
- b) Write the technical specifications and applications of DSRC technology. [5]

Q7) Attempt any two of the following :

- a) Explain the use of 6G network in collision avoidance. Write the applications of 6G network. [4]
- b) Draw the block diagram of ASK and explain it. Write the applications of ASK. [3]
- c) Explain the VSAT operation using neat diagram and write its features. [5]



Total No. of Questions : 7]

SEAT No. :

PC4312

[Total No. of Pages : 2

[6344]-2002

First Year M.Sc.

ELECTRONIC SCIENCE

ELS-552-MJ : Control System

(2023 Credit Pattern) (Semester - II)

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) Questions 2 to 7 carry equal marks.
- 4) Neat diagram must be draw wherever necessary.

Q1) Solve any five of the following :

[10]

- a) List advantages of block diagram system.
- b) Write disadvantages of Open Loop System.
- c) What is transfer function. List it's applications.
- d) Define Poles and Zeros of transfer function.
- e) State absolute stable and unstable system.
- f) What are advantages of PID controllers.

Q2) a) i) Explain the application of control system for speed control of dc motor. [4]

- ii) A controller outputs a 4 to 20 MA signal to control motor speed from 140 to 600 rpm with a linear dependance. Calculate (a) current corresponding to 310 rpm and (b) the value of (a) expressed as the percent of control output. [3]

b) For a system with characteristics equation

$$F(S) = S^6 + 3S^5 + 4S^4 + 6S^3 + 5S^2 + 3S + 2 = 0, \text{ examine stability. [5]}$$

P.T.O.

- Q3) a) i)** Consider open loop transfer function $G(s)H(s) = \frac{k}{s(s+2)}$. [4]
- 1) Find $s = -1 + j$ and $s = 3j$ on the root Locus?
 - 2) If so, what is the corresponding value of k ?
- ii) Derive transfer function of canonical system. [3]
- b)** A PI controller is reverse acting with 12 repeat per minute having propotional band 20. Find [5]
- i) Propotional gain
 - ii) Integral gain and
 - iii) Time that the controller output will reach 0% after a constant error of 1.5% starts. The controller output when the error occurred was 72%.
- Q4) a) i)** Explain any four block diagram reduction rules. [4]
- ii) Write short note on Recorders. [3]
- b)** Explain three position controller. [5]
- Q5) a) i)** For a propotional controller, the controlled variable is a process temperature with a range of 50 to 130°C and a set point of 73.5°C. Under nominal conditions the set point is maintained with an output of 50%. Find the propotional offset resulting from a load change that requires a 55% output if the propotional gain is [4]
- 1) 0.1 and
 - 2) 0.7
- ii) Write short note on solenoid valve. [3]
- b)** What is SCADA? Explain it architecture with details. [5]
- Q6) a) i)** Explain the terms phase margin and gain margin. [4]
- ii) Draw ladder diagram for AND, OR and NOT Logic gate. [3]
- b)** Explain feed forward control system. [5]
- Q7) Write short note on any two of the following :** [12]
- a) Position Control System.
 - b) Fuzzy Logic Controller.
 - c) Bode Plot.

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Total No. of Questions : 5]

SEAT No. :

PC-4313

[Total No. of Pages : 2

[6344]-2003
M.Sc. (Part - I)
ELECTRONIC SCIENCE
ELS 553 MJ: Industrial Automation (IA)
(2023 Pattern) (Semester - II)

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 pencil use (other than red color) is not restricted.

Q1) Attempt any five of the following : **[5]**

- a) What is long form of SCADA?
- b) What is the lowest level in the hierarchy of Industrial Automation?
- c) What is long form of "MES" in industrial automation level?
- d) What is the difference between PLC and SCADA?
- e) Draw the PLC symbol for Rails.
- f) Draw the PLC symbol for Rungs.

Q2) Attempt the following :

- a) i) List and explain any four needs of Industrial Automation. **[4]**

OR

List and explain any four Benefits of Industrial Automation.

- ii) What is function of CPU in PLC. **[2]**
- b) Draw the PLC system Block Diagram or Architecture diagram. **[4]**

P.T.O.

Q3) Attempt the following :

- a) i) Explain with diagram why is a PLC Ladder Diagram named using the word "Ladder". [4]

OR

Give any two comparator symbols and any two Logical operations symbols in PLC Ladder diagram.

- ii) Give the symbol used for "Normally close" and "Normally open" in PLC. [2]
- b) Explain need of "Scan Cycle" in details. [4]

Q4) Attempt the following :

- a) i) Give the name of any four programming languages which support PLC. [4]

OR

Give the name of any four companies which manufactures PLC.

- ii) Why sequencer is important in PLC? [2]
- b) Explain any four ways how you can incorporate Artificial Intelligence (AI) to enhance the efficiency of PLC. [4]

Q5) Write short notes on any four of the following : [4 × 2½ = 10]

- a) Role of UP counter and down counter.
- b) Role of timer in PLC.
- c) Five levels of Automation Hierarchy.
- d) 'SCADA' systems.
- e) Impact of PLC on manufacturing Industry.
- f) Types of programming in Automation system.
- g) Role of VR and AR in future of Industrial Automation.



Total No. of Questions : 5]

SEAT No. :

PC-4314

[Total No. of Pages : 2

[6344] - 2004

M.Sc. - I

ELECTRONIC SCIENCE

ELS 560 MJ: Instrumentation Systems and Applications

(2023 Pattern NEP) (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.*

Q1) Solve any Five of the following :

[5]

- a) Name sensors used in agriculture.
- b) Define gauge factor in case of pressure measurement.
- c) How absolute humidity is expressed?
- d) Which temperature sensor is bimetallic?
- e) Name any two transducers used in Pressure measurement.
- f) What is Internet of Things?

Q2) Answer the following :

- a) i) Draw and describe the pin diagram of IR temperature module MLX90614ESF. **[3]**
- ii) Explain the working principle of capacitive displacement pressure transducer. **[3]**
- b) Explain the basic building blocks of DAS. **[4]**

P.T.O.

Q3) Answer the following :

- a) i) Why fiber optic sensors are used in place of traditional sensors?[3]
- ii) Explain how the calibration is done in thermocouple? [3]
- b) Describe various modes of operation of piezoelectric transducer “For medium and high frequencies, the magnitude of voltage across loads is independent of frequencies” comment. [4]

Q4) Answer the following :

- a) i) Explain the exhaust sensors used in automobile. [3]
- ii) Explain the advantages and limitations of potentiometer. [3]
- b) Describe the construction of two types of strain gauge. [4]

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

- a) Components of ECG
- b) Principle of working of Hall effect
- c) Soil hygrometer.
- d) Electro-chemical sensors
- e) Orifice flow meter
- f) Eddy current proximity sensors.



Total No. of Questions : 5]

SEAT No. :

PC-4315

[Total No. of Pages : 2

[6344]-2005

M.Sc. (Electronic Science)

**ELS561MJ: APPLICATIONS OF ARTIFICIAL
INTELLIGENCE AND MACHINE LEARNING
(2023 Pattern) (Semester - II)**

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 diagram must be drawn wherever necessary.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) Solve Any Five of the following:

[5]

- a) Give difference between deductive and inductive Reasoning.
- b) Define the term variance.
- c) State expectation maximization Algorithm.
- d) Give advantages of KD-trees.
- e) How do you estimate the error of a binary classifier?
- f) What role does probabilistic reasoning play in handling uncertainty within knowledge based system?

Q2) Answer the following:

- a) Describe how reinforcement learning algorithms handle environments with non deterministic rewards and action. **[6]**
- b) Write short note on error correcting output codes. **[4]**

P.T.O.

Q3) Answer the following:

- a) Explain how the choice of distance measure influences the out comes of clustering algorithm. [6]
- b) What is knowledge based agent in AI? what are the key components of it's Architecture? [4]

Q4) Answer the following:

- a) Describe the relationship between dynamic programming and reinforcement learning. How do concept from dynamic programming apply to solve RL problem. [6]
- b) Write a short note on any rules of inference. [4]

Q5) Write short notes on Any Four of the following: [10]

- a) Binomial distribution.
- b) Nearest neighbour method.
- c) Model combination schemes.
- d) Q Learning.
- e) Basics of sampling theory.
- f) Random forests trees.



Total No. of Questions : 5]

SEAT No. :

PC-4316

[Total No. of Pages : 2

[6344] - 2006

M.Sc. (Electronic Science)

ELS 562-MJ: Fundamentals and Applications of AVR
Microcontroller

(NEP) (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) Questions 2 to 5 carry equal marks.

Q1) Answer any Five of the following :

[5 × 1 = 5]

- a) What is the internal vref of the ATmega32 ADC?
- b) How many timer registers available in AVR32?
- c) Find the step angle for stepper motor, of 100 steps required to complete one revolution?
- d) Write the pin function of TDI and TMS pins of AVR32.
- e) Define the conversion time of ADC.
- f) What is the hex value of the command code for “display on, cursor on”?

Q2) Answer the following :

- a) i) Find the value for TCCRO if we want to program timer 0 in normal mode, no prescaler. [2]
ii) Write the steps for programming the AVR32 to transfer the data serially. [4]
- b) Draw and explain the block diagram of ATmega32 [4]

P.T.O.

Q3) Answer the following :

- a) i) Write an AVR32 'C' program to toggle all the bits of port B 200 times. [2]
- ii) Draw and explain 8-bit the status register (SREG) [4]
- b) Draw the DAC interfacing a diagram with AVR32 microcontroller and write 'C' program code for triangular. [4]

Q4) Answer the following :

- a) i) Draw the interfacing diagram of LCD with AVR32. [2]
- ii) Find the timer's clock frequency and its period for AVR32 system with crystal frequency 16MHz and 8MHz. Assume that prescaler of 1:64 is used. [4]
- b) Write an AVR32 'C' program to convert FD hex number to decimal and display the digits on Port B, Port C and Port D. [4]

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

- a) The 8-bit format of ADCSRA
- b) Bit wise shift operators in AVR32.
- c) Interfacing LM35 with AVR32.
- d) 'C' data types used in AVR32.
- e) Steps to program timer 0 in normal mode.
- f) General purpose registers.



Total No. of Questions : 7]

SEAT No. :

PC4839

[6344]-3001

[Total No. of Pages : 2

M.Sc. - II

ELECTRONIC SCIENCE

ELS 601 MJ: Electromagnetics and Microwaves

(2023 Credit Pattern) (Semester - III)

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) *Q. 2 to Q. 7 carry equal marks.*

Q1) Solve any five of the following:

[5×2=10]

- a) What is VSWR?
- b) What is cut-off frequency in waveguide?
- c) Write the electric & magnetic field wave equation for conducting medium.
- d) What is stub matching in transmission Lines?
- e) List the different types of transmission Line.
- f) State Gauss law of magnetic field.

Q2) a) i) Starting with Maxwell equation obtain the wave equations for electromagnetic waves in free space. **[4]**

ii) With the help of neat diagram, explain working of tunnel diode. **[3]**

b) Explain cavity resonator and Q. Factor of cavity resonator. **[5]**

Q3) a) i) State and prove Poynting theorem. **[4]**

ii) What is Smith chart? what are its important characteristics? **[3]**

b) Explain different methods of excitation of TE and TM mode in waveguide. **[5]**

P.T.O.

- Q4)** a) i) Derive the relation between VSWR and voltage reflection coefficient. [4]
- ii) Differentiate optical fiber and circular waveguide. [3]
- b) Find the skin depth for copper at 10 Hz and 100 Hz frequency? (For copper, $\mu=\mu_0$, $\sigma=5.8\times10^7$ s/m). [5]
- Q5)** a) i) What is Ampere's Law? explain it in short. [4]
- ii) With suitable diagram explain the construction and working of magnetron oscillator. [3]
- b) A transmission Line has a characteristic impedance of $50\ \Omega$ (Z_0) and is terminated in a Load impedance of $40+30j\ \Omega$. Find the Reflection coefficient and the standing wave ratio. [5]
- Q6)** a) i) What is impedance matching? Why impedance matching is necessary in transmission Lines? [4]
- ii) What is a wave guide? what are the waveguide components? [3]
- b) With the help of suitable diagram explain the construction and working of Gunn diode. [5]
- Q7)** Attempt any two of the following.
- a) Write a short note on. [6]
- i) READ diode.
- ii) Magic tee.
- b) Explain single stub and double stub matching. [6]
- c) Write a short note on. [6]
- i) Microwave Isolators
- ii) Skin depth



Total No. of Questions : 7]

SEAT No. :

PC4840

[6344]-3002

[Total No. of Pages : 2

M.Sc. - II

ELECTRONIC SCIENCE

ELS-602-MJ: Foundation of Semiconductor Devices

(Credit 2023 Pattern) (Semester - III)

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.*

Q1) Solve any five of the following:

[10]

- a) Define doping.
- b) What is pinchoff condition in JFET?
- c) Give advantages of MOSFET over BJT.
- d) Explain the meaning of contact potential.
- e) Define fermi Level.
- f) What are the advantages of PLD's?

Q2) Answer the following.

- a) Discuss the difference between HBT & BJT. Give the special features of HBT & energy level diagram of HBT. **[7]**
- b) Draw diagram indicating the fermi Dirac distribution function for **[5]**
 - i) Intrinsic semiconductor
 - ii) N-type semiconductor
 - iii) P-type semiconductor

Q3) Answer the following.

- a) Explain energy band diagram in MOS capacitor with N-type substrate in Accumulation, Depletion & Inversion mode. **[7]**
- b) Explain the ideal current. Voltage relation for N-channel MOSFET for **[5]**
 - i) Depletion mode
 - ii) Enhancement mode

P.T.O.

Q4) Answer the following.

- a) What is mean by zener effect in reverse biased P-N Junction? Explain concept of excess carrier generation and recombination rate accross the semiconductor. [7]
- b) With the help of neat labelled diagram & IV characteristics explain the structure of BJT. [5]

Q5) Answer the following.

- a) What is carrier concentration in semiconductor material? Explain with the help of fermi energy distribution. [7]
- b) Explain the working principle of PIN diode. [5]

Q6) Answer the following.

- a) Explain the working principle of varactor diode. Draw its structures & Give the application. [7]
- b) Explain Eber-Moll Model for NPN BJT. [5]

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

- a) Effect of temperature on mobility of carriers.
- b) Types of bands in solids.
- c) Construction of MOSFET.



Total No. of Questions : 5]

SEAT No. :

PC-4843

[Total No. of Pages : 2

[6344]-3003
M.Sc.-II
ELECTRONIC SCIENCE
ELS 603 MJ : Advanced Industrial Electronics
(2023 Pattern) (NEP) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) Q.1 is compulsory.
- 2) solve any Three Questions from Q2 to Q5
- 3) Q.2 to Q.5 carry equal marks.

Q1) Attempt any five of the following : **[5]**

- a) List any two Turn off methods of Thyristor.
- b) Draw the ideal characteristics of SCR.
- c) Draw the circuit symbol of DIAC & TRIAC.
- d) What is full form "IGBT"?
- e) List triggering methods of SCR.
- f) Draw the ideal characteristics of power diode.

Q2) Attempt the following :

- a)
 - i) Write a short note on class commutation of SCR **[2]**
 - ii) Explain construction and working of SCR **[4]**
- b) Draw and Explain single phase full wave Controlled rectifier **[4]**

Q3) Attempt the following :

- a)
 - i) Explain Gate triggering method of SCR. **[2]**
 - ii) Draw and Explain working of step down chopper circuit. **[4]**
- b) Draw and Explain circuit diagram of Resistance capacitance firing circuit for SCR. **[4]**

P.T.O.

Q4) Attempt the following :

- a) i) Draw and Explain two transistor model of SCR [2]
- ii) Draw and Explain single phase voltage source Inverter circuit. [4]
- b) Explain construction and working of IGBT [4]

Q5) Attempt any Four of the following : [10]

- a) Write a note on " GTO".
- b) Explain applications of PC -Dc converters.
- c) Compare power MOSFET & IGBT.
- d) Write a note on VFD's
- e) Draw and Explain ideal characteristics of SCR.
- f) Write a note on cycloconverters.



Total No. of Questions : 5]

SEAT No. :

PC4841

[6344]-3004

[Total No. of Pages : 2

M.Sc. - II

ELECTRONIC SCIENCE

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

[10]

- a) Define: Chopper Circuit.
- b) What is the purpose of using HEV?
- c) What is soft switching in inverters?
- d) Why Domestic charging for EV is important?
- e) What is the role of Battery Swapping station?
- f) Give two types of Energy consumption.

Q2) Answer the following.

[10]

- a) i) Give any two reasons behind using Ultra capacitors. **[2]**
ii) Write a comparison of Hard switching, and soft Switching converters. **[4]**
- b) Explain single motor drive system in an Electric Vehicle (EV). **[4]**

P.T.O.

Q3) Answer the following. [10]

- a) i) Mention two types of battery chargers. [2]
- ii) Explain role of stator and rotor in an electric motor. [4]
- b) Write a note on limitations of resources for an EV. [4]

Q4) Answer the following. [10]

- a) i) What is occasional charging station. [2]
- ii) Name any four types of batteries. [4]
- b) Write a note on Importance of Electric vehicle Performance. [4]

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

- a) Advantages of wireless charging Technology.
- b) Power flow control system.
- c) Working of AC motor.
- d) Three - Phase full Bridge Voltage - Fed Inverter.
- e) Micro processor based charger circuit.
- f) Move and charge zone.



Total No. of Questions : 5]

SEAT No. :

PC4842

[Total No. of Pages : 2

[6344]-3005

M.Sc. - II

ELECTRONIC SCIENCE

ELS 611 MJ: Fundamentals and Applications of Raspberry Pi

Using Python

(2023 Credit Pattern) (Semester - III)

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.*

Q1) Solve any five of the following:

[5×1=5]

- a) List any two types of single board computers.
- b) State any two functions of operating system.
- c) Which processor used in Raspberry Pi?
- d) What is SBC?
- e) List the standard data types of python language.
- f) What is the use of import time function in python?

Q2) a) i) What is the NOOBS software?

[2]

ii) Explain the interfacing of an LED with raspberry Pi using neat diagram and implement the same using python programming. **[4]**

b) Draw block diagram of SOC and explain it.

[4]

Q3) a) i) List any four operators used in python.

[2]

ii) Explain in detail interfacing push button switch and LED with RPi using neat block diagram. **[4]**

b) What are the basic comparison operators in python.

[4]

P.T.O.

- Q4)** a) i) Explain the List and tuple data types of python. [2]
ii) Draw the block diagram of single board computer and explain it. [4]
b) How to install an OS on a raspberry Pi3? [4]

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

- a) Raspberry Pi3 features.
- b) Digital signal processor.
- c) Network Access Devices.
- d) Graphics processing unit.
- e) How RPi used in IoT?
- f) Raspberry Pi pin number declaration.



Total No. of Questions : 5]

SEAT No. :

PC-4844

[Total No. of Pages : 2

[6344]-3007

M.Sc - II

ELECTRONIC SCIENCE

ELS - 613- MJ : Nanotechnology

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

Time : 2 Hours]

[Max. Marks :35

Instructions to the candidates:

- 1) *Q.1 is compulsory.*
- 2) *Attempt any three Questions from Q.2 to Q5.*
- 3) *Q.2 to Q.5 carry equal marks.*

Q1) Attempt any Five of the following.

[5]

- a) Name any two 1 - D nanostructured materials.
- b) What is relaxation time?
- c) Give the advantage of sol - gel method.
- d) What is reason of using dye synthesized nanoparticle based solar cell arrays in space craft?
- e) Mention the common types of IR spectrometers.
- f) What do you mean by gels in nanotechnology?

Q2) Attempt the following:

- a) Explain Molecular beam epitaxy in detail. **[5]**
- b) Write the uses of nanomaterials in sports and toys. **[5]**

P.T.O.

Q3) Attempt the following:

- a) What is Raman shift? Explain Raman Photoillumiance with neat labelled diagram. [5]
- b) Write a short note on semiconductor nanoparticle . [5]

Q4) Attempt the following :

- a) Describe x- ray Photoelectron spectroscopy in the analysis of nanomaterials. [5]
- b) Write a short note on optical aborption & transmission of nanomaterials. [5]

Q5) Attempt any Four of the following: [10]

- a) Give the classification of nanomaterials on the basis of band gap.
- b) Write the use of nanomaterials in tissue repairing.
- c) Explain in short electric arc deposition.
- d) Explain the Process of sol - gel formation.
- e) Give the use of nanomaterials in cosmetics.
- f) Describe the photovoltaic effect in short.

