SEAT No. :

**PA-3364**

**[5917]-11**

**M.Sc. (Part - I)**
**ELECTRONIC SCIENCE (CBCS)**
**ELUT 111 : Mathematical Methods in Electronics Using C**
**(2019 Pattern) (Semester - I) (Credit-4) (Paper - 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.*

*Q1)* Solve any <u>five</u> of the following :                                    **[10]**

  a)   Find the laplace transform of $e^{-2t} \cos 2t \, u(t)$.

  b)   What are the different type of differential equations. Give example of any one.

  c)   Explain Scanf() & Printf() function.

  d)   What is unary operator?

  e)   Decide degree & order of DE given by $\dfrac{d^2 y}{dx^2} + \sqrt{\dfrac{dy}{dx}} + y = 0$

  f)   Define continous & Discrete time signal.

*Q2)* Attempt the following :

  a)   i)   Determine Co-ordinate of point $\rho(2, 3, 5)$ which is in cartesian co-ordinate system in spherical as well as cylindrical.   **[4]**

       ii)  What is mean by two Port Network? Define impedance, admitance function.   **[3]**

  b)   Write down the laplace equation is spherical coordinate system & seperate the variable in it to obtain the ordinary D.E.   **[5]**

*P.T.O.*

*Q3)* Attempt the following :

a) i) What is Transfer function. Find transfer function of following circuit. **[4]**
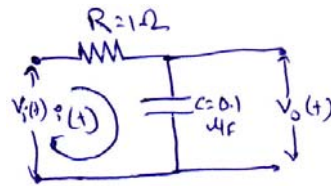


ii) Define z-transform. Find z-transform of unit step sequence. **[3]**

b) Write a c-program to create a file to store information about a person (name, age, salary). **[5]**

*Q4)* Attempt the following :

a) i) Check the stability of polynomial D(S) using Routh Hurwitz criteria. **[4]**

$$D(S) = S^4 + 2S^3 + S^2 + 2S + 1 = 0$$

ii) Draw poles & zero for H(S) given by **[3]**

$$H(S) = \frac{(S-1)(S+5)}{S(S+1)(S+1-j2)(S+1+j2)}$$

b) Define laplace transform. Find inverse laplace transform of

$$F(s) = \frac{2s+5}{s^2 + 5s + 6}$$ by using partial fraction method. **[5]**

*Q5)* Attempt the following :

a) i) Find the solution for $D.E \dfrac{dy}{dx} = \dfrac{x+1}{2-y} y \neq 2$ **[4]**

ii) Explain difference between Post fix & pre fix operators. **[3]**

b) State final & initial value theorem. Determine the initial & final value

for $F(S) = \dfrac{10(S+1)}{S(S^2 + 2s + 3)}$ **[5]**

**Q6)** Attempt the following :

a) Define Z-transform, inverse Z-transform & ROC. Find Z-trans of

$\dfrac{1}{(1 - Z^{-1})(1 - 2Z^{-1})}$ given Roc $< |z| < 2$. **[7]**

b) Explain the properties of laplace transform. **[5]**

**Q7)** Attempt any <u>two</u> of the following :

a) Write short note on : **[6]**

   i) Partial differential equation

   ii) Ordinary differential equation

   iii) Linear D.E.

b) Write short note on : **[6]**

   i) Array

   ii) Pointer

c) Write short note on : **[6]**

   i) Unit Ramp Signal

   ii) Unit Parabolic Signal

   iii) Sinusoidal signal

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SEAT No. :

**[Total No. of Pages : 3**

## [5917]-12
## F.Y. M.Sc.
## ELECTRONIC SCIENCE
## ELUT 112 : Analog Circuit Design
## (2019 Pattern) (CBCS) (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 from 2 to 7 carry equal marks.*

*Q1)* Solve any <u>five</u> of the following : **[10]**

a) What is clipper? Draw the circuit diagram and waveforms for positive biased clipper.

b) What is effect of temperature on diode characteristics?

c) State advantages of h parameters.

d) What are characteristics of common collector amplifier?

e) If $R_1 = R_2 = 1k\Omega$, $C_1 = C_2 = 0.47\mu f$, what is the frequency of oscillation of Wien Bridge Oscillator?

f) If $R_f = 100k\Omega$, $R_{in} = 2k\Omega$ and $V_{out} = 2V$, what will be input voltage of inverting amplifier?

*Q2)* Solve the following : **[12]**

a) The rev. leakage current of transistor in CB configuration is $0.2\mu A$ & $18\mu A$ when it is connected in CE configuration calculate $\alpha_{dc}$ & $\beta_{dc}$ of the transistor (Assume $I_B = 30mA$).

b) "The cut off frequencies of single stage amplifiers are influenced by R-C combinations" Justify the statement.

c) Explain the exact CE hybrid model.

*P.T.O.*

*Q3)* Solve the following : **[12]**

a) In the CS amplifier, $R_D = 5k\Omega$, $R_G = 10m\Omega$, $\mu = 50$, $r_d = 35k\Omega$. Evaluate the voltage gain Av, input impedance $Z_i$ and output impedance $Z_o$.
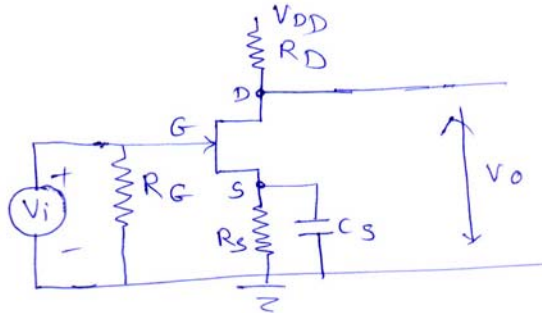


b) Draw the equivalent circuit of capacitance coupled single tuned amplifier and explain it.

c) How the bandwidth of op-amp affected by its negative feedback? Explain the closed loop and open loop response of op-amp with frequency response.
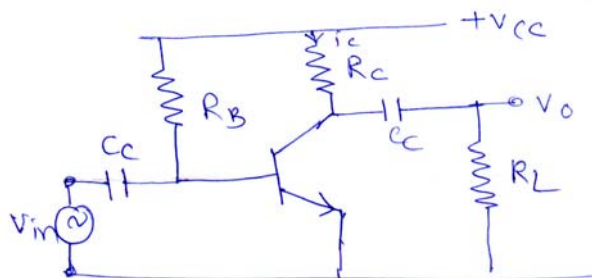
*Q4)* Solve the following : **[12]**

a) Give the comparison of JFET & BJT.

b) Explain the working of phase shift oscillator & determine the frequency of oscillation if $R_1 = R_2 = R_3 = 200k\Omega$ & $C_1 = C_2 = C_3 = 100pf$.

c) What are the features of instrumentation amplifier? Draw the circuit arrangement of it & describe its major functions.

*Q5)* Solve the following : **[12]**

a) In the transistor amplifier shown in figure, $R_c = 8k\Omega$, $R_L = 24k\Omega$ and $V_{CC} = 24$. Draw the d.c. load line and determine the optimum operating point. And also draw ac load line.
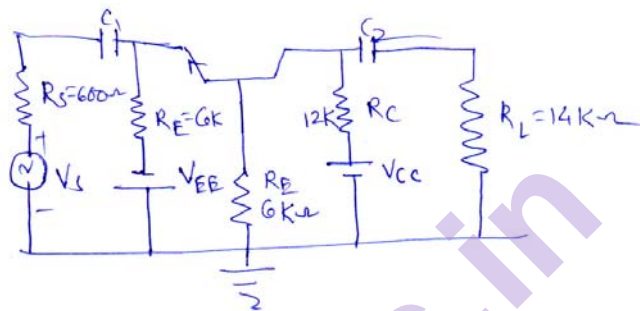
b) What is cross over distortion? Explain with suitable diagram.

c) What is miller oscillator? Explain with neat diagram.

*Q6)* Solve the following :                                                    **[12]**

a) Calculate the values of input-resistance, output resistance, current gain and voltage gain for common base amplifier circuit. $h_{ie} = 24\Omega$, $h_{fb} = 0.98$, $h_{rd} = 2.9 \times 10^{-4}$, $h_{ob} = 0.49\mu A/V$.



b) Explain the working of stagger tuned amplifier.

c) What is PLL? Draw block diagram of it & explain.

*Q7)* Attempt any <u>two</u> of the following :                               **[12]**

a) Explain the working of RC coupled amplifier with its circuit diagram.

b) Explain the factors which affect the frequency stability of an oscillator what is frequency range of RC & LC oscillators.

c) i) What are the steps to design low pass filter?

   ii) Design a high pass filter with cut off frequency 1KHz & pass band gain of 2.

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# M.Sc. (Part - I)
## ELECTRONIC SCIENCE
## ELUT-113 : Digital System Design (Paper - III)
### (2019 Pattern) (CBCS) (Semester - I) (Credits 4)

*Time : 3 Hours]*                                                  *[Max. Marks : 70*

*Instructions to the candidates:*

1) *Question 1 is compulsory.*

2) *Answer any Five questions from Q.2 to Q.7.*

3) *Questions 2 to 7 carry equal marks.*

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

a) What is mean by static RAM?

b) Explain the design flow of Digital circuits.

c) Define Gate level modeling.

d) State the advantages of PLD's.

e) Write a verilog code for Full Adder.

f) What are the characteristics of Verilog programming language.

*Q2)* Attempt the following :

a) What is mean by comparator? Draw the block diagram of 5-bit comparator?                                                          **[4]**

b) What is SPLD's? Explain the classification of SPLD's.         **[4]**

c) Explain blocking and Non blocking assignment in Verilog.     **[4]**

*Q3)* Attempt the following :

a) Design a 4 bit parallel subtractor using Full Adder.         **[4]**

b) Construct a 32:1 MUX using two 16:1 MUX.                     **[4]**

c) Write a Verilog code for 7-segment decoder.                  **[4]**

*P.T.O.*

*Q4)* Attempt the following :

a)  What is difference between Synchronous & Asynchronous counter.

**[4]**

b)  What is mean by RAM? What are the types of RAM?  **[4]**

c)  Write a Verilog code for Traffic Light control system.  **[4]**


*Q5)* Attempt the following :

a)  What is mean by LUT? Explain the operation of LUT.  **[4]**

b)  Describe the working of bidirectional shift resistor with block diagram.

**[4]**

c)  Write a Verilog code for 4-bit Up/Down counter.  **[4]**


*Q6)* Attempt the following :

a)  Define following terms in Verilog :  **[4]**

    i)   Nets                          ii)  Registers

    iii) Arrays                        iv)  Strings

b)  Explain the working of 4-bit parallel adder using Full Adder.  **[4]**

c)  Design a mod-12 Asynchronous Counter.  **[4]**


*Q7)* Attempt any two of the following :  **[12]**

a)  Explain the following control statements in Verilog with examples.

    i)   if-elseif

    ii)  while

    iii) case

b)  What is mean by programmable Arrays? How to obtain sop and pos equation.

c)  Define Race around condition. Explain the working of master-slave JK flip-flop.


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# M.Sc.

## ELECTRONIC SCIENCES

## ELDT-114 : Basics of Fiber Optical Communication

## (2019 Pattern) (Semester - I) (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 cary equal marks.*

*4)* *Neat diagrams must be drawn whenever necessary.*

*5)* *Use of calculator is allowed.*

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

a) State the condition of total internal reflection in fiber optic cable.

b) What is fiber splice?

c) States the name of block used in fiber optic communication block.

d) Repeaters are used in fiber optic communication, comment.

e) What is acceptance cone?

f) Define the term dispersion in optical fiber.

*Q2)* Attempt the following :

a) i) Compare between single mode and multimode fiber.        **[2]**

   ii) Using simple ray theory, describe the mechanism of transmission of light in fiber.        **[4]**

b) Describe the three types of fiber misalignment which may contribute to insertion loss at an optical fiber joint.        **[4]**

*Q3)* Attempt the following :

   a)   i)   State the advantages of fiber optic communication system.   **[2]**

        ii)   Explain absorption losses in fiber optic cable.   **[4]**

   b)   Describe what is meant by the fusion splicing of optical fibers. Discuss the advantages and drawbacks of this jointing technique.   **[4]**


*Q4)* Attempt the following :

   a)   i)   Which factors are responsible for intrinsic joint losses in a fiber?   **[2]**

        ii)   Explain the different splicing techniques of fiber.   **[4]**

   b)   An optical fiber in air has an NA of 0.4, compare the acceptance angle for meridional rays with that for skew rays which change direction by 100º at each reflection.   **[4]**


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

   a)   With neat diagram explain the structure of fiber optic cable.

   b)   State the different types of fiber based on index profile and explain it in detail.

   c)   Write a short note on regenerative repeater.

   d)   Explain the linear scattering losses in fiber optic cable.

   e)   Write a short note on cylindrical ferrate connectors.

   f)   Write a short note on fiber buffering.


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# M.Sc.

# ELECTRONIC SCIENCES

## ELDT-114 : Fundamentals and Applications of PIC Microcontroller

### (2019 Pattern) (Semester - I) (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)* *Figures to the right indicate full marks.*

*4)* *Neat diagrams must be drawn whenever necessary.*

*Q1)* Solve any five of the following : **[5 × 1 = 5]**

a) Give name of PIC SFR's which are not 8-bit.

b) Which timer's possess an ability to prevent an endless loop hanging condition of PIC along with its own on-chip RC oscillator by contribution to its reliable operation?

c) Give the default direction of I/O port upon reset.

d) Which of the following addressing mode used TBLPTR register as a pointer in PIC?

e) Give importance of debounce period in key board scanning.

f) Which instruction in PIC is used to perform 2's complement.

*Q2)* Solve the following :

a) i) Which features of RISC architecture helps to increase the microcontroller? **[3]**

   ii) Explain the PIC I/O port structure in detail. **[3]**

b) Write and explain assembler directives for PIC microcontroller and their use with examples. **[4]**

*Q3)* Solve the following :

a) i) Explain how bit manipulated instructions works in PIC and explain their advantages. **[3]**

ii) Write PIC assembly program to monitor RB0 & RB1 pins and rotate DC motor as follows : **[3]**

| RB1 | RB0 | |
|------|------|---------------|
| 0 | 0 | Stop |
| 0 | 1 | Clockwise |
| 1 | 0 | Anticlockwise |
| 1 | 1 | Stop |

b) Four data items are stored in RAM locations of PIC starting at 40H. 40H = 71, 41H = 88, 42H = 69 and 43H = 97. Write an assembly language program to find the sum of all the numbers. **[4]**

*Q4)* Solve the following :

a) i) Write a PIC assembly program to bring data in from PO RTA & send it to PORTC continuously after subtracting the value 9 from it. **[3]**

ii) Explain in detail how CALL instructions works in PIC. **[3]**

b) Two common cathode seven segment displays are connected to PIC in multiplexed fashion. Write assembly program to display 99 number continuously on these displays. **[4]**

*Q5)* Solve any four of the following : **[4 × 2½ = 10]**

a) Give power management features available in PIC 18 microcontroller.

b) Describe any three data transfer instructions of PIC18 with example.

c) Write differences between CALL and RCALL instruction in PIC.

d) Give any three advantages of PIC over other microcontrollers.

e) Write a note on pipelining concept.

f) Draw the flowchart for interfacing stepper motor to PIC to rotate clockwise.

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## M.Sc. (Part - I) (Semester - II)
### ELUT 121 : ELECTRONIC SCIENCE
### Applied Electromagnetics, Microwaves and Antennas
## (Paper - I) (2019 Pattern) (4 Credit)

*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.*

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

　a)　State Poynting theorem.

　b)　What are the important features of horn antenna.

　c)　Define Radiation Intensity of an antenna.

　d)　What do you mean by Smith chart?

　e)　List the different types of Transmission line

　f)　What are the waveguide component?

*Q2)* Attempt the following :

　a)　i)　Given the expression for propagation constant γ(gamma) for electromagnetic waves in a dielectric medium as $\gamma = \alpha + j\beta = \sqrt{jw\mu(\sigma + jw\in)}$, obtain an expression for α & β.**[4]**

　　　ii)　Explain different method of impedance matching on transmission line.　　　　　　　　　　　　　　　**[3]**

　b)　A transmission line has the following parameters R = 2 Ω/m G = 0.5 mmho/m f = 1GHz　　　　　　　　　　　　　**[5]**

　　　L = 8nH/m　　　　　　　　　　C = 0.23 pF

　　　calculate i) characteristic impedance ii) propagation constant

*P.T.O.*

*Q3)* Answer the following :

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

ii) Explain standing wave Ratio. **[3]**

b) A certain transmission line has characteristic impedance of $75 + j0.01\Omega$ and its terminated in a load impedance of $70 + j50\Omega$. Compute (i) reflection coefficient; (ii) Transmission coefficient (iii) Verify $T^2 = \dfrac{Z_l}{Z_o}(1-\Gamma_l^2)$ **[5]**

*Q4)* Answer the following :

a) What are the various type of power losses in rectangular waveguide? What do the term $TE_{mn}$ & $TM_{m,n}$ stand for circular waveguide? **[7]**

b) Find the effective area of half wave dipole at 1GHz. **[5]**

*Q5)* Answer the following :

a) i) With suitable diagram explain the construction and working of a magnetron oscillator (cavity magnetron) **[4]**

ii) State any three characteristics of electromagnetics waves. **[3]**

b) Obtain the boundary conditions for EM waves at the interface between two dielectric medium. **[5]**

*Q6)* Answer the following :

a) i) What are the applications of Klystron? Explain its working with neat diagram. **[4]**

ii) Write a short note on cavity resonator. **[3]**

b) An air-filled rectangular waveguide of inside dimension $7 \times 3.5$ cm operates in the dominant $TE_{10}$ mode as shown in fig. **[5]**

i) Find the cut off frequency

ii) Determine the phase velocity of the wave in the guide at a frequency of 3.5 GHz.

iii) Determine the guided wavelength at the same frequency.

*Q7)* Attempt <u>any two</u> of the following :

    a)    Write a short note on :         **[6]**

        i)    End fire antenna

        ii)    Broad band antenna

    b)    Explain single stub and double stub matching.     **[6]**

    c)    Write a short note on :         **[6]**

        i)    Microwave Isolator

        ii)    GUNN effect

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## M.Sc. (Part - I)
## ELECTRONIC SCIENCE
## ELUT-122: Instrumentation and Measurement Techniques
## (Credit System) (2019 Pattern) (Semester - II) (4 Credit)

*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.*

*Q1)* Solve any <u>five</u> of the following :                        **[10]**

a) What is linearity?

b) State advantages and applications of bimetallic thermometers.

c) A thermo meter is calibrated between 150ºC to 200ºC. The accuracy is specified within $\pm 0.25\%$ of instrument span. What is the maximum static error?

d) Give principle of operation of resistance strain gauge.

e) List examples of active transducers and passive transducers.

f) What is noise? List the different types of noise.

*Q2)* Attempt the following :

a) What are strain gauges? Derive an expression for gauge factor of strain gauge.                                                     **[7]**

b) Describe the time domain analysis of measurement system for step input, ramp input and impulse input.                               **[5]**

*P.T.O.*

*Q3)* Attempt the following :

a) What are the basic blocks of generalized instrumentation system? Draw block diagram and explain the function of each block. Give the classification of instruments. **[7]**

b) Draw equivalent circuit diagram of piezo electric transducer. Describe the piezo electric transducer used for pressure measurement. **[5]**

*Q4)* Attempt the following :

a) What is order of measurement system? Derive the first order electrical system gives the output voltage, $e_o = Ei [1-\exp(-t/\tau)]$. **[7]**

b) The temperature of a given body is measured alternatively by using a total radiation pyrometer and an optical pyrometer and both the instruments have been calibrated with respect to a black body. The indicated value of optical pyrometer is 1200ºC, the emissivity of the body is known to be 0.6. Constant C2 in Plank's law is 0.014387 m-k. Wavelength at which intensities are compared is 0.7 mm. Calculate : **[5]**
   i) actual temperature of body
   ii) indicated temperature in degree celcius of the total radiation pyrometer.
   iii) error in temperature measurement

*Q5)* Attempt the following :

a) Discuss with neat diagram the construction principle and working of LVDT. Draw output characteristics of LVDT. **[7]**

b) The following 10 observations were recorded when measuring a voltage are 41.7, 42.0, 41.8, 42.0, 42.1, 41.9, 42.0, 41.9, 42.5 and 41.8. Find mean, standard deviation, probable error of one reading and probable error of mean. **[5]**

*Q6)* Attempt the following :

a) What are different types of measurement errors? Discuss gross error with suitable example. A voltmeter having a sensitivity of 1000 Ω/V reads

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100 V on its 150V scale when connected across an unknown resistor in series with milli ammeter. When the milli ammeter reads 5 mA, determine:

   i)    apparent resistance of the unknown resistor.

   ii)   actual resistance of the unknown resistor.

**[7]**

b)   A linear resistance potentiometer is 50 mm long and is uniformly wound with wire having resistance of 10 kΩ. Under normal condition, the slider is at the center of the potentiometer. Find the linear displacement when the resistance of the potentiometer as measured by Wheatstone bridge for two cases -       **[5]**

   i)    3850 Ω

   ii)   7560 Ω

*Q7)* Write short notes on any <u>two</u> of the following :       **[12]**

a)   Null type instrument.

b)   Hot wire anemo meters.

c)   Mcleod Gauge.

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**M.Sc. (Part - I)**

**ELECTRONIC SCIENCE**

**ELUT 123 : Foundation of Semiconductor Devices**

**(2019 Pattern) (Semester - II) (Credits - 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 7.*

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

*Q1)* Solve <u>any Five</u> of the following : **[10]**

a) What is unit cell?

b) Define fermi level.

c) What is epitaxial growth?

d) Explain the meaning of contact potential.

e) List the types of basic crystal structure.

f) BJT is bipolar device, comment.

*Q2)* Attempt the following :

a) Define packing fraction in cubic lattice. Find the packing fraction of FCC, BCC and SC structures. **[7]**

b) Give the difference between classical and quantum statistics. State the statistical laws used for explaining the behaviour of particles. **[5]**

*Q3)* Attempt the following :

a) A Silicon Hall device at 300°K has the following geometry. $d = 10^{-3}$cm, $W = 10^{-2}$cm and $L = 10^{-1}$cm. with $I_x = 0.75$ mA, $V_x = 15$V, $V_H = +5.8$mV and $Bz = 10^{-1}$ tesla. **[7]**

Determine :

i) Type of con ductivity

ii) Majority carrier concentration

b) Explain the concept of effective mass. Show that in semiconductor material mass of electron is positive in E-K space. **[5]**

*Q4)* Attempt the following :

a) Discuss the difference between HBT and BJT. Give the special features of HBT and energy level diagram of HBT. **[7]**

b) Explain low frequency small signal two port equivalent circuit of BJT.**[5]**

*Q5)* Attempt the following :

a) Discuss ideal I-V characteristics of a JFET. Describe internal pinch off voltage and pinch off voltage of JFET giving suitable mathematical relationship. **[7]**

b) Explain Fermi-Dirac probability function at absolute zero and higher temperature. **[5]**

*Q6)* Attempt the following :

a) Explain the Zener effect and avalanche effect in a reverse biased p-n junction. Describe concept of excess carrier generation and recombination rate across a semiconductor. **[7]**

b) Give the position of fermi-level in extrinsic semiconductor. Draw energy band diagram with suitable equations. Give the significance of fermi-level in metals. **[5]**

*Q7)* Attempt the following (Any tow) :

a) How JFET different from MESFET? Explain the constructional details of n-channel MESFET. **[6]**

b) Explain CZ method for semi conductor crystal growth. With neat labelled diagram. **[6]**

c) Consider non-ideal diode equation, $i_D = 1.7mA$. if $V_D$ is changed by 2mV then what will be the change in $I_D$? Assume $V_T = \dfrac{KT}{q} = 26mV$.**[6]**

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### [5917] - 24
## M.Sc. (Part-I) (Semester - II)
## ELECTRONIC SCIENCE
## ELDT124: Fiber Optic Communication Systems
## (2019 Pattern) (CBCS) (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)*   *Questions Q2 to Q5 carry equal marks.*

*Q1*) Solve any five of the following :

a)   State the need for isolators.                                           **[1]**

b)   What are industrial lasers.                                             **[1]**

c)   Define the optical amplifiers.                                          **[1]**

d)   Mention the critical elements involved in calculating power budget.   **[1]**

e)   What is attenuation in fiber optic cable.                              **[1]**

f)   State the purpose of optical multiplexing in optical communication.  **[1]**

*Q2*) Answer the following :                                                **[10]**

a)   i)   What is an optical switch? List its types.                        **[2]**

    ii)   Explain the working of Raman Amplifier with advantages and disadvantages.                                                      **[4]**

b)   Discuss the optical power budget with an example.                      **[4]**

*Q3*) Answer the following.                                                 **[10]**

a)   i)   What is dispersion in optical fiber? List the methods of dispersions.                                                          **[2]**

    ii)   State the necessity, principle and types of WDM in optical fiber communication.                                               **[4]**

b)   Explain the concept of integrated optics.                             **[4]**

*Q4)* Answer the following : **[10]**

    a)    i)    List the various types of fiber optic sensors? **[2]**

            ii)    Explain the optical wavelength converter with its types.

    b)    Design on optical fiber link for transmitting IJMB/sec of data for a distance of 4km with BER of $10^{-9}$. **[4]**

*Q5)* Write a short note on any four of the following.

    a)    Optical couplers. **[2.5]**

    b)    Semiconductor optical amplifiers. **[2.5]**

    c)    Optical power meters. **[2.5]**

    d)    Rise time budget. **[2.5]**

    e)    Wavelength division multiplexing RDWDM. **[2.5]**

    f)    Dispersion in single mode optical fiber cable. **[2.5]**

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# [5917] - 24
# M.Sc. (Part-II) (Semester - II)
# ELECTRONIC SCIENCE
# ELDT124: Fundamentals and Applications of AVR Microcontroller
# (2019 Pattern) (CBCS) (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)*   *Figures to the right indicate full marks.*
    *4)*   *Neat diagram must be drawn wherever necessary.*
    *5)*   *Use of calculator is allowed.*

*Q1 )* Solve any <u>five</u> :        **[5]**

    a)      Comment on "Why assembler directives are also called as pseudo code".

    b)      Give the meaning of AVR instruction CBI PORTB, 1.

    c)      How many rows and coloumns are present in 16×2 alphanumeric LCD?

    d)      How can the direction of the DC motor be changed?

    e)      Which registers cannot be used in LDI instruction of AVR?

    f)      Define debounce period in keyboard interfacing.

*Q2 )* Solve the following.

    a)    i)      Write an AVR assembly program to load the values 0×30 and 0×97 into locations 0×105 & 0 × 106 respectively.    **[3]**

         ii)      Write an AVR assembly program to load Monitor bit PC3. When it is High, send 0×55 to PORTD.    **[3]**

    b)      Draw the architecture of AVR and explain in short.    **[4]**

*Q3 )* Solve the following.

    a)    i)      Write an Assembly program to convert ASCII digits of '7' and '2' to packed BCD.    **[3]**

  ii) Draw the seven segment display interfacing diagram with AVR and Write an AVR C. Program to display 0 to 9 numbers on it.  **[3]**

 b) Draw interfacing diagram of temperature. Sensor LM35 and heater using relay to AVR. Write ac program to implement ON-OFF temperature controller.  **[4]**

*Q4)* Solve the following.

 a) i) Explain SFR associated with I/O ports of AVR micro controller. Write assembly language program to toggle all the bits of PORTD.**[3]**

  ii) Draw the DAC interfacing diagram with AVR and write an AVR C program to display square wave of 50% duty cycle.  **[3]**

 b) Draw the circuit diagram of Target Board for AVR. Draw Reset and oscillator circuit. Write different clock sources available for AVR.  **[4]**

*Q5)* Solve any Four.        **[4×2.5=10]**

 a) Explain in short interrupt structure of AVR.

 b) Draw the structure of AVR status register and explain use of each bit.

 c) Explain different addressing modes of AVR.

 d) A switch is connected to Pin PD3 and LED to PC7, write a C program to get the status of SW and send it to LED.

 e) Write down the algorithm for key pressed detection in 4×4 keyboard interfacing to AVR.

 f) Write down the flowchart for interfacing dot matrix display to AVR and display 'H' character on it.

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**M.Sc. - II**

**ELECTRONIC SCIENCE**

**ELT - 231 : Advanced Communication Systems**

**(CBCS 2019 Pattern) (4 Credits ) (Semester - III) (Paper - I)**

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

**Q1)** Solve any five of the following. **[10]**

a) Define

i) Directivity

ii) Antenna gain

b) Define Noise and explain internal noise inshort.

c) Define satellite.

d) Write the advantages of BPSK

e) A receiver has an input signal power of 1.0 mW. The Noise power is 0.35 mW. calculate the signal to noise ratio.

f) Calculate Frequency deviation fo FM signal with Modulating Frequency of 5KHz and Modulation index of 0.5.

**Q2)** a) Describe Ground wave propagation of electromagentic wave. **[4]**

b) Explain the atmospheric Noise and space Noise in short. **[4]**

c) Explain the working of QPSK. **[4]**

**Q3)** a) With help of diagram explain Delta modulation. **[4]**

b) Describe XModem protocol and write the impotances of it. **[4]**

*P.T.O.*

c) Equation for FM wave is e = 12 cos ($6\times10^8$t + 5 sin 1250t)

Find the carrier Frequency, Modulating Frequency, Modulation Index & maximum deviation. **[4]**

**Q4)** a) With the help of block diagram. Explain Active and passive satellites. **[4]**

b) Compare flat reflector and corner reflector antenna. **[4]**

c) Construct Hamming code for Data information 0110 with even parity. **[4]**

**Q5)** a) Explain the working principle of rectangular horn antenna. **[4]**

b) How GSM works, explain with architecture. **[4]**

c) An AM broadcast station operates at its maximum allowed total output of 50 KW and 95% modulation. How much power is transmitted in sidebands. **[4]**

**Q6)** a) What are microwaves. Write their application with Frequency range. **[4]**

b) Describe the sky wave propagation with the help of diagram. **[4]**

c) Draw the block diagram of communication system and explain it in short. **[4]**

**Q7)** Write short notes on any two of the following.
a) What is the working principle of parabolic reflector antenna? Write it's advantages & applications. **[6]**

b) Draw the block diagram of FM receiver and explain the function of each block in short & write application of FM. **[6]**

c) Explain time division multiple access (TDMA). Write its advantages and applications. **[6]**

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**Total No. of Questions : 7]**

**SEAT No. :**

**PA-3373**

[Total No. of Pages : 2]

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# M.Sc. -II

# ELECTRONIC SCIENCE

## ELT-232 : Mechatronics and Robotics

### (2019 Pattern) (Semester-III) (Credit-4) (Core Compulsory)

*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)*    *Figures to the right indicates full marks.*

    *4)*    *Neat diagram must be drawn whenever necessary.*

    *5)*    *Use of calculator is allowed.*

*Q1)* Solve any five of the following.          **[5×2=10]**

    a)    Write any two applications of mechatronics system.

    b)    What is Robot?

    c)    What is mean by mechanical building block?

    d)    Define angular acceleration.

    e)    What is Relay?

    f)    What is trajectory planning?

*Q2)* Attempt the following.

    a)    i)    Write any two types of Robots.      **[3]**

           ii)    Explain basic construction and working of DC motor.      **[4]**

    b)    Draw and explain MOSFET's and write it's application.      **[5]**

*Q3)* Attempt the following.

    a)    i)    What is translation and rotational system models?      **[3]**

           ii)    Explain skew symmetric matrices.      **[4]**

    b)    What is Sensor? Explain motion sensor and vibration Sensor.      **[5]**

*Q4)* Attempt the following.

    a)    i)    What is rack and pinion?      **[3]**

           ii)    Explain first order and second order system with example.      **[4]**

    b)    Explain belt and chain drives used as a mechanical actuating system.**[5]**

*Q5)* Attempt the following.

    a)    i)    What is manipulator? Give its example. **[3]**

            ii)    What is cams? Write its types and explain any one. **[4]**

    b)    Explain joint space scheme Via point and circular motion. **[5]**

*Q6)* Attempt the following.

    a)    i)    What is DC motor and PMDC motor. **[3]**

            ii)    Write a note on joint space scheme. **[4]**

    b)    Explain roll-pitch-yaw representation. **[5]**

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

    a)    Thyristors as switch.

    b)    Composition law for rotational transformation.

    c)    Electrical actuating system.

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# M.Sc. - II
## ELECTRONIC SCIENCE
### ELUT - 233 : Control System
### (CBCS 2019 Pattern) (Semester - III)

*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.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Use non-programmable calculator is allowed.*

*Q1)* Solve any <u>Five</u> of the following:          **[10]**

a) What is integral wind up?

b) What are the advantages of root locus technique?

c) Sketch the out put of PI controllers for a step input.

d) List the information that should be contained in alarm and trip documentation.

e) What are the different types of control system?

f) Determine the transfer function of the open loop system.

*Q2)* Answer the following:

a) Explain the advantages of DCS system. Explain the architecture of SCADA system.          **[7]**

b) Explain the concept of stability. With suitable examples predict stability of a control system from location of its closed loop poles in the S-plane?**[5]**

*Q3)* Answer the following:

a) Explain the application of control system for speed control of dc motor.**[7]**

b) Draw a graph of PD controller output as a function of time $K_P = 5$, $K_D = 0.55$, and $P_0 = 20\%$ when input in the following form. **[5]**



fig. Q3 b)
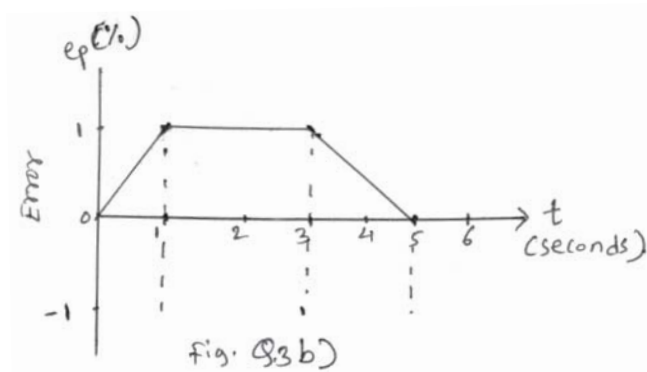
*Q4)* Answer the following:

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 elements of closed loop control system. What are elements of liquid level controller with suitable diagram. **[5]**

*Q5)* Answer the following:

a) Explain the working of ON-OFF controller circuit. Give the design of ON-OFF controller circuit using LM 35 temperature sensor. **[7]**

b) Use Routh criteria to determine stability and location of pole of system represented by characteristic equation. **[5]**

$F(S) = S^5 + 4S^4 + 8S^3 + 8S^2 + 7S + 4$

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*Q6)* Answer the following:

a) Define root-locus for a control system. Consider a control system with

$G(S)H(S) = \dfrac{K}{S(S+2)}$ obtain the nature of root locus. **[7]**

b) What is recorder? State type of recorder and explain any two types? **[5]**

*Q7)* Write short note on any <u>two</u> of the following: **[12]**

a) Adaptive control system.

b) Zeigler-Nichols method for process loop typing.

c) Solenoid valve.

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**SEAT No. :**

**[5917]-34**

## M.Sc. (Part - II) (Electronic Science)

## ELT - 234 : WIRELESS COMMUNICATION SYSTEM - I

## (2019 - Pattern) (Semester - III) (Credit - 2) (Elective Theory Course)

*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 do you mean by wireless local loop?

b) What is mean by WLAN?

c) What is RFID means?

d) What is the MIMO System?

e) What is an OFDM System?

f) What are the functions of a RAKE Receiver?

*Q2)* a) i) What is meant by Smart Antenna? **[2]**

ii) What are GSM system? What are the three major inter connected subsystems in GSM architecture? **[4]**

b) Write a note on Wireless Communication System with examples. **[4]**

*Q3)* a) i) What is meant by GSM? **[2]**

ii) Write a note on Radio interface. **[4]**

b) Write a note on Bluetooth and Personal Area Networks. **[4]**

*Q4)* a) i) What is GSM Protocol? **[2]**

ii) Write a note on beam forming. **[4]**

b) Write a note on Software defined radio in Wireless Communication. **[4]**

*Q5)* Write short notes on any <u>four</u> of the following: **[10]**

a) Performance of CDMA System.

b) Soft handoff.

c) CDMA features.

d) Third Generation (3G).

e) Satellite Communication.

f) Types of Wireless Communication System.

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**PA-3375**

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**M.Sc. (Part - II) (Electronic Science)**

**ELT - 234 : FUNDAMENTALS OF INTERNET OF THINGS**

**(2019 - Pattern) (Semester - III) (Credit - 2) (Elective Theory Course)**

*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)    Define IoT.

    b)    Give two applications of IoT.

    c)    What is meaning of ITU-T?

    d)    Define RFID.

    e)    What is full form of WSN?

    f)    What is EPCIS?

*Q2)* a)   i)    What is full form of QoS? What is its Role?      **[2]**

         ii)    Write a note on Wireless Sensor Networks.      **[4]**

    b)   Write a note on RFID Technology.      **[4]**

*Q3)* a) i) What is Web of Things? **[2]**

   ii) Write a note on IP for IoT. **[4]**

   b) Write a note on Data Link layer protocols. **[4]**


*Q4)* a) i) What is node? Why it is important. **[2]**

   ii) Write a note on WSN Architecture. **[4]**

   b) Write a note on Basic Nodal Capabilities. **[4]**


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

   a) Device Intelligence.

   b) WSN Infrastructure establishment.

   c) IoT Architecture.

   d) Routing Protocols.

   e) EPC Global Architecture.

   f) ITU-T views.

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# M.Sc. (Part - II) (Electronic Science)
# ELT-241 : PLC PROGRAMMING AND APPLICATIONS
## (2019 Pattern) (Semester - IV) (Credit System)
## (Credit 2) (Elective ) (Theory)

*Time : 2 Hours]*            *[Max. Marks : 35*

*Instructions to the candidates:*
1) *Questions 1 is compulsory.*
2) *Solve any 3 questions from Q2 to Q5.*
3) *Figures to the right side indicate full marks.*
4) *Neat diagram must be drawn wherever necessary.*
5) *Use of non-programmable calculator is allowed.*


*Q1)* Answer any FIVE questions.            **[5×1=5]**

   a)    What is the function of a PLC input interface module?

   b)    Draw the system of normally open limit switch and normally closed temperature actuated switch.

   c)    List three 16-bit words of counter element.

   d)    What is the use of MCR instruction?

   e)    Which file is the defualt output status file?

   f)    Name the four basic math instructions used in PLC.


*Q2)* Answer the following questions.

   a)    i)    List PLC specifications. The counter instruction of PLCS are normally retentive comment.    **[3]**

           ii)    Explain off-delay timer instruction in detail.    **[3]**

   b)    Draw a suitable diagram and discuss the working of PLC in detail.    **[4]**


*Q3)* Answer the following questions.

   a)    i)    List out the different input and output field devices used in PLC.**[3]**

           ii)    What is ladder diagram ? Explain the function of XIO, XIC and OTE in relation with ladder diagram.    **[3]**

   b)    Draw the ladder diagram for traffic light control system.    **[4]**

*Q4)* Answer the following questions.

    a)    i)    Draw the ladder diagram for following function table.    **[3]**

| Inputs | | Outputs | | | |
|:---:|:---:|:---:|:---:|:---:|:---:|
| $I_1$ | $I_2$ | $Q_1$ | $Q_2$ | $Q_3$ | $Q_4$ |
| 0 | 0 | 1 | 1 | 0 | 0 |
| 0 | 1 | 0 | 1 | 1 | 0 |
| 1 | 0 | 0 | 0 | 1 | 1 |
| 1 | 1 | 1 | 0 | 0 | 1 |

        ii)    Explain processor memory organization with necessary diagram.**[3]**

    b)    Draw block diagram for bottle filling plant and construct the ladder diagram for same.    **[4]**

*Q5)* Answer any FOUR questions.    **[4×2.5=10]**

    a)    Construct up-down counter by cascading two counters.

    b)    Write a note on structured Text.

    c)    Draw the ladder diagram for motor in forward and reverse direction.

    d)    Draw the electrical symbol used to represent each of the following switches.

        i)    No pushbutton.

        ii)    NC pushbutton.

        iii)    NC limit switch.

        iv)    No Pressure switch.

        v)    NC level switch.

        vi)    No proximity switch.

    e)    Write a note on programming device.

    f)    Draw ladder diagram of 3-input NAND gate and draw the functional block diagram for 3 - input NOR gate.

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**SEAT No. :**

**[Total No. of Pages : 2**

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# M.Sc.-II
## ELECTRONIC SCIENCE
### BLDT-243 : Technical Writing
### (2019 CBCS Pattern)  (Semester-IV)

*Time : 3 Hours]*                                                                                           *[Max. Marks : 70*

*Instructions to the candidates:*

*1)   Q.No.1 is compulsory.*

*2)   Solve any five questions from Q.2 to Q.7.*

*3)   Questions 2 to 7 carry equal marks.*

*4)   Figures to the right side indicate full marks.*

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

a)   What do you mean by verbal communication?

b)   What are the elements of communication?

c)   List out types of report?

d)   What do you mean by group discussion? Write its's significance.

e)   Define reading? List out types of reading abilities.

f)   What is purpose of an inter view?

*Q2)* a)   What is thesis? Explain structure of thesis in details.                         **[7]**

b)   Explain interpersonal communication in details.                                  **[5]**

*Q3)* a)   What is business communication? Discuss 7C's of business writing in brief.                                                                                                    **[7]**

b)   Explain how language is an important tool in communication.          **[5]**

*Q4)* a)   What is publics speaking? Briefly discuss characteristics of good speaker.                                                                                                  **[7]**

b)   Highlight general interview process & explain the factors to be consider for effective interview preparation?                                          **[5]**

*P.T.O.*

*Q5)* a) What do you mean by synopsis? Briefly explain structure of synopsis.**[7]**

   b) Highlight differences between general communication and technical communication **[5]**

*Q6)* a) Define flow of communication and explain flow of communication in details. **[7]**

   b) Explain barriers of effective communication. **[5]**

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

   a) Classroom presentation skills.

   b) Importance of writing technical report.

   c) Importance of comprehension skills.

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