[5838]-101

M.Sc. (Part-I)
ELECTRONIC SCIENCE
ELUT-111 : Mathematical Methods in Electronics using C.
(2019 Pattern) (Semester -I) (Paper-III) (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 Q.7.***
   3) ***Questions 2 to 7 carry equal marks.***

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

   a)   Decide the degree & order of the differential equation.

$$\left[\frac{d^2 y}{dx^2} + \left(\frac{dy}{dx}\right)^2\right]^4 = k^2 \left(\frac{d^3 y}{dx^3}\right)^2$$

   b)   Find the Laplace transform of cosh(at)

   c)   Define signals what do you mean by continous time signal.

   d)   What do you mean by linear & non-Linear differential equation.

   e)   Explain fseek() & rewind ( ) function

   f)   List different types of memory allocation in C.

Q2) Attempt the following.

   a)   i)   Determine the general solution of the differential equation

$$\frac{dy}{dt} + 3t^2 y = 6t^2$$ **[4]**

       ii)   Write Bessel differential equation list application of Bessel equation in Electronics.   **[3]**

   b)   Use separation variable to solve 3-D Laplace equation in castesian co-ordinates. obtain its solution.   **[5]**

Q3) Answer the following.

   a)   i)   Test the following polynomial is HUIWITZ polynomial or not F(S)=3s³+3s²+2S+1=0   **[4]**

       ii)   State final value theorem determine the final value of

$$F(S) = \frac{5(S+1)}{(S+2)(S+3)}$$ **[3]**

P.T.O.

b) Define Laplace transformation & state its advantage over other classical methods. **[5]**

Determine Laplace transform of

i) Unit step function

ii) Unit Impulse function

Q4) Answer the following.

a) i) The Co-ordinates of point in cylindrical system are $(r, \theta,,z) = \left(2, -\dfrac{\pi}{4}, 1\right)$ and

the co-ordinates of point in spherical system are $(\rho, \theta, \phi) = \left(2, \dfrac{\pi}{4}, \dfrac{\pi}{3}\right)$

determine their co-ordinates in cartesian system. **[4]**

ii) Explain partial differential equation. **[3]**

b) What is meant by state variables? What is the need of it? What are state equations, What are the advantages of state variable method over other methods. **[5]**

Q5) Answer the following.

a) i) Explain with the example the difference between declaration and definition of a function. **[4]**

ii) Explain with example the scope of variables in C. **[3]**

b) Define convolution theorem. Find f(t) using convolution

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

Q6) Attempt the following.

a) i) Define Transfer function. Find the T.F of Passive RC High pass filter **[4]**

ii) Plot poles and Zeros in s-Plane for function $H(S) = \dfrac{2S + 1}{S^2 + 5S + 6}$ **[3]**

b) i) Define Z-transform & inverse Z-transform. **[5]**

ii) Determine inverse Z-transform of X(y)

$$X(y) = \frac{1}{1 - 1.5Z^{-1} + 0.5Z^{-2}} \text{ for ROC is } |Z| > |$$

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

a) Discuss decision making loopl statement in C. with example. **[6]**

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

i) Unit Impulse signal

ii) Unit Step signal

iii) Ramp signal

c) Explain the properties of laplace transform (Any Three). **[6]**

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Total No. of Questions : 7]

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SEAT No. :

[Total No. of Pages : 2

[5838]-102
M.Sc.-I
ELECTRONIC SCIENCE
ELUT-112 : Analog Circuit Design
(CBCS 2019 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)   *Quenstions Q.2 to 7 carry equal marks.*

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

    a)   What is reverse recovery time of diode?.

    b)   State different types of distortion in amplifier.

    c)   "Bias stability is required for transistor amplifier". Comment on this. Which is the best biasing method to stabilize Q point?

    d)   Identify the circuit below & determine output waveform.

    e)   What are essential conditions for oscillations? What are different types of LC oscillators ?

    f)   What is difference between input offset current & input bias current? What is effect of input offset current on performance of op-amp?

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

    a)   What are the advantages of "r_e" model of transistor? Explain the equivalent circuit of NPN transistor for CE & CB configuration.

    b)   Explain the working of transformer coupled amplifier with neat circuit diagram.

    c)   What are characteristics of input stage and output stage of op-amp?

P.T.O.

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

   a)   Draw the energy band diagram of a PN junction and explain the working of a diode.

   b)   A crystal has following parameters L=0.5H; C_s=0.06PF, C_p=1PF & R=5KΩ. Find the series & Parallel resonent frequencies.

   c)   Design a differentiator to differentiate an input signal that varies in frequency from 10 Hz to 1kHz.

Q4) Solve the following. **[12]**

   a)   Obtain expression for input impedence and output impedence for inverting Amplifier.

   b)   With the help of circuit diagram, explain the operation of Colpitt's oscillator. Write an expression for the frequency of oscillations of it.

   c)   Explain the application of PLL as frequency multiplier.

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

   a)   Explain switching characteristics of junction diode.

   b)   Determine h parameters for CE configuration.

   c)   Draw the equivalent circuit of quartz crystal. Explain the working of Colpitt's crystal oscillator using neat labelled diagram.

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

   a)   Draw a fixed bias circuit of transistor & derive a expression for its stability factor. State advantages of this biasing.

   b)   Draw the circuit diagram of phase shift oscillator using. BJT. IF R_1=R_2=R_3=200KΩ & C_1=C_2=C_3=100PF, find the frequency of oscillation.

   c)   What is internal & external compensation in op-amp?

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

   a)   Explain distortion in amplifier in detail.

   b)   Explain the working of RC coupled amplifier. What are its advantages?

   c)   What are the effects of op-amp parameters on DC and low frequency applications and wide band amplifier?

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[5838]-103

M.Sc.-I
ELECTRONIC SCIENCE
ELUT 113 : Digital System Design
(CBCS 2019 Pattern) (Semester -I) (Paper-III) (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 Q.7.*
3) *Questions Q.2 to 7 carry equal marks.*

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

a) Define priority encoder.

b) What is mean by exitation tables & transition table.

c) Differentiate between ASIC & PLD'S

d) Write a note on clocked JK-Flip-Flop.

e) State the importance of HDL'S.

f) Write a verilog code for 2:1 MUX.

Q2) Attempt the following.

a) Write a note on D-Flip-Flop and T Flip-Flop. **[4]**

b) What is difference between combinational & sequential circuit. **[4]**

c) Explain Timing control in verilog. **[4]**

Q3) Attempt the following.

a) Explain the tasks and functions in verilog. **[4]**

b) Discribe the working of BCD to 7 segment decoder driver. **[4]**

c) What are the types of PLD's? Explain in brief. **[4]**

Q4) Attempt the following.

a) Explain the Moore & Mealy circuit models with block diagram. **[4]**

b) What do you mean by memory address and capacity? explain basic memory operations. **[4]**

c) Write a verilog, code for 8-bit priority encoder using nested 'if' statement.
[4]

P.T.O.

Q5) Attempt the following.

    a)   Explain basic organization of Dynamic RAM. What is mean by DRAM?

                                                                                               [4]

    b)   Design a 4-bit synchronous decade counter.   **[4]**

    c)   Write a verilog code for 3 to 8 line decoder.   **[4]**

Q6) Attempt the following.

    a)   What is the difference between verilog and VHDL language.   **[4]**

    b)   Write a not on Johnson counter. Draw the block diagram and timing waveform of it.   **[4]**

    c)   Write a verilog code for 8:1 MUX.   **[4]**

Q7) Solve any two of the following.   **[12]**

    a)   Define Look ahead carry generator. Design a 4 bit look ahead carry generator.

    b)   Draw a block diagram of stepper motor controller. Write a verilog code for stepper motor controller.

    c)   What is mean by multiplexed display? Draw a block diagram of 4-digit LED display with leading zero blanking.

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SEAT No. :

[Total No. of Pages : 4

[5838]-104

M.Sc. (Part-I)
ELECTRONIC SCIENCE
ELDT114 : Basics of Fiber Optical Communication
(2019 Pattern) (Semester - I) (Credit-2)

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

Instructions to the candidates:
1) *Q. No. 1 is compulsory.*
2) *Solve any three questions from Q.2 to Q.5.*
3) *Q.2 to Q.5 carry equal marks.*
4) *Neat diagram must be drawn wherever necessary.*
5) *Use of calculator is allowed.*

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

   a) What do you mean by meridional ray?

   b) Define numerical aperture (NA) of optical fiber.

   c) What is Fiber splice?

   d) What is attenuation in fiber optic?

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

   f) List the factor due to which connecter loss occur.

Q2) Answer the following.

   a)   i) State advantages and disadvantages of fiber optic communication.

         [2]

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

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

Q3) Answer the following.

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

     ii) Derive the expression for numerical aperture (NA) of fiber optic cable based on ray theory analysis **[4]**

P.T.O.

b) Explain in brief the problem of fresnel reflection at all types of optical fiber joint. **[4]**

Q4) Answer the following.

a) i) What do you mean by total internal reflection? state condition to obtain total internal reflection. **[2]**

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

b) A Silica optical fiber with a core diameter large enough to be considered by ray theory analysis has a core refractive index of 1.50 and a cladding refractive index of 1.47. Determine:

i) Critical angle at core-cladding interface

ii) NA for the fiber

iii) The acceptance angle in the air for the fiber **[4]**

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

a) Explain material dispersion in fiber optic cable.

b) List the misalignment which may occur when jointing compatible optical fiber.

c) Write a short note on Splices in fiber optic.

d) Explain LED driver circuit.

e) Write a short note on fiber buffering.

f) What is optical repeater? Explain regenerative repeater.

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P528

[5838]-104

M.Sc. (Part-I)
ELECTRONIC SCIENCE
ELDT114 : Fundamentals and Applications of PIC Microcontroller
(2019 Pattern) (Semester - I) (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.*

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

a) Which pin of the LCD is used for adjusting its contrast?

b) Which operational features of PIC allows it to reset especially when the power supply drops the voltage below 4V?

c) What are the maximum number of banks that the PIC 18 can have?

d) What is the meaning of a step angle is stepper motor?

e) How many bits the PIC 18 program counters can have?

f) Give the use of Goto instruction in PIC 18.

Q2) Solve the following.

a) i) Compare CISC & RISC architecture. **[3]**

   ii) Draw the format of the flag register of PIC & explain in short. **[3]**

b) Draw interfacing of 16×2 LCD to PIC. Write PIC assembly program to display "DOES" on LCD. **[4]**

Q3) Solve the following.

a) i) Write a PIC assembly program to determine if data on PORTC contains the value 65H. If so, write 'H' to PORTD, otherwise make PORTD= 'L' **[3]**

   ii) Explain different addressing modes of PIC with suitable examples.**[3]**

b) Write a note on concept of pipelining. **[4]**

Q4) Solve the following.

   a)   i)   Write PIC assembly program to add 4 to WREG 15 times & place the result in PORT B. **[3]**

       ii)   Draw data memory map of PIC and explain in short. **[3]**

   b)   Draw interfacing of stepper motor to PIC. Write PIC assembly program to rotate motor clockwise. **[4]**

Q5) Solve any four.   **[4×2.5=10]**

   a)   List any five features of PIC 18 microcontroller.

   b)   Describe any three logical instruction of PIC 18 status register.

   c)   Explain any three instructions related to Flag bits of PIC 18 status register.

   d)   Write a PIC assembly program to create a square wave of 50% duty cycle on bit O of PORTC.

   e)   Write down the algorithm for key pressed detection in keyboard interfacing to PIC.

   f)   Draw the flowchart for Interfacing seven segment display to PIC to display 0-9 numbers on it.

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[5838]-201

M.Sc. (Part-I)
ELECTRONIC SCIENCE
ELUT-121 :Applied Electromagnetic, Microwaves and Antenna
(2019 Pattern) (Semester -II) (Paper-I) (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 Q.7.
3) Quenstions Q.2 to 7 carry equal marks.

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

    a) What is stub matching?

    b) Distinguish between co-axial & optical transmission line.

    c) Why wave guide are preferred for high frequency transmission.

    d) How Antenna play an important Role in Communication system.

    e) Find characteristic impedance of loss less transmission line having $R = 5\Omega$, L=40H, C=10F having frequency of 10Hz.

    f) A Transmission line has reflection coefficient $0.7 < 35°$. Find voltage SWR.

Q2) Attempt the following.

    a) State & prove poynting theorem. **[7]**

    b) What do you mean by microstripline? Explain, different types of microstrip line. **[5]**

Q3) Attempt the following.

    a) Explain the Phenomenon of negative Resistance. Characteristics of GUNN diode state the different modes of operation of GUNN diode. **[7]**

    b) With the suitable diagram explain cavity resonators. **[5]**

Q4) Attempt the following.

    a) Discuss smith chart with reference to. **[7]**

       i) Important characteristics.

       ii) Write down any two application.

P.T.O.

b) A Telephone cable has following parameter per loop km R=30Ω, L=20mH, C=0.06μf, *G=0* if the applied signal has angular frequency 5000 rad/Sec determine.

   i) Characteristics of Impedance

   ii) Propogation constant **[5]**

Q5) Attempt the following.

a) What is skin depth? Derive expression for it determine skin depth of copper at 30GH$_z$ **[7]**

b) A Short vertical Antenna has a length L which is 0.05λ at frequency (f). If its Radiation Resistance at f is RΩ what its radiation resistance at frequency 2F. **[5]**

Q6) Attempt the following.

a) Explain how an Antenna can be used to measure temperature. **[7]**

b) A 2cm×3cm waveguide is filled with dielectric material Er=4.If the waveguide operates at 20GH$_z$ with TM11 mode. Find **[5]**

   i) Cutoff frequency

   ii) Phase constant

Q7) Attempt any two of the following.

a) Write a short note on different type of losses occur in microstrip line.**[6]**

b) Write a short note on magnetron oscillator. **[6]**

c) Write a short note on optical fiber with reference to following points. **[6]**

   i) Types

   ii) Fiber optic system

   iii) Advantages

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[5838]-202

M.Sc. (Part-I)
ELECTRONIC SCIENCE
ELUT-122 :Instrumentation And Measurement Techniques
(2019 Pattern) (Semester -II) (Credit System) (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 Q.2 to 7 carry equal marks.*

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

   a) Write working principle of potentiometer.

   b) What is threshold?

   c) State the limitations of turbine meter.

   d) List the advantages of electronic instruments over electrical and mechanical instruments.

   e) Why measurements by direct method are not preferred?

   f) A Wheat stone bridge requires a charge of 7Ω in the unknown arm of the bridge to produce a change in deflection of 3 mm of the galvanometer determine the static sensitivity.

Q2) Attempt the following.

   a) Give classification of transducers. Describe the selection criteria for transducers for measurement of physical parameters.   **[7]**

   b) With block diagram explain the elements of generalized measurement system.   **[5]**

Q3) Attempt the following.

   a) Explain the construction and working of thermocouples. List the advantages and disadvantages of themocouples.   **[7]**

   b) At the input an amplifier has a signal voltage level of 3μV and a noise voltage level 1μV. What is signal to noise ratio at the input? if the voltage gain of the amplifier is 20, What is the S/N ratio at the output? If the amplifier adds 5μV of noise, what is S/N ratio at the output? Calculate the noise factor and noise figure.   **[5]**

Q4) Attempt the following.
   a) List the methods of correction of instruments. Explain any three methods in detail. **[7]**
   b) A beam type load cell of width 200 mm and thickness 50 mm is to be mounted with four strain gauges, which will enable measuring load of 100 kN. If the strain gauges are to be mounted at the root of the canti lever, determine the approximate length of the beam. Use aluminium as a beam material and four electrical resistance strain gauges as the sensors. Determine $\left(\Delta Eo/V\right)_{max}$ and sensitivity for this type of load cell.

   (Given : E=70 GPa, $\nu = 0.33$, σ_f =150 MPa, Sg=2 and Rg=120Ω) **[5]**

Q5) Attempt the following.
   a) Define the terms linearity, hysteresis and static sensitivity. **[3]**
   A 10 kΩ Variable resistance has a linearity of 0.1% and the movement of contact arm is 320º determine the maximum position deviation in degrees and the resistance deviation in ohm. If this instrument is to be used as a potentiometer with linear scale of 0 to 1.6V, determine the maximum voltage error. **[4]**
   b) State different types of strain gauges. **[2]**
   A strain gauge is bonded to a beam 0.1 m long and has a cross-sectional area 4 cm^2. The strain gauge has an unstrained resistance of 240 Ω and a gauge factor of 2.2 When a load is applied, the resistance of gauge changes by 0.013Ω. Calculate The change in length of steel beam and amount of force applied to the beam (young, modulus for steel=207 GN/m^2) **[3]**

Q6) Attempt the following.
   a) What is loading effect? Describe loading effect due to shunt connected instrument with suitable example. How loading effect is minimized in this case? **[7]**
   b) Distinguish between deflection and null type instruments. Discuss applications of measurement. **[5]**

Q7) Write short notes on any two of the following. **[12]**
   a) Electromagnetic flow meter.
   b) Resistance potentiometer.
   c) Optical pyrometers.

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[5838]-203

M.Sc.-I
ELECTRONIC SCIENCE
ELUT-123 : Foundation of Semiconductor Devices
(2019 Pattern) (Semester -II) (4 Credits)

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

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

    a)   The mobilities of free electrons and holes in pure germanium are 0.38 and 0.18 m^2/v.s. What will be the conductivity of germanium? (Assume $ni=2.5×10^{19}/m^3$)

    b)   A silicon diode has a bulk resistance of 2Ω and a forward current of 12 mA, then Find the voltage drop across the silicon diode.

    c)   Comment- "In reverse bias condition of p-n junction, junction offer high resistance".

    d)   Define Miller indices.

    e)   What are the advantageous of MOSFET & over BJT?

    f)   what is pinch off condition in JFET.

Q2) Attempt the following questions:

    a)   Show that total current density of electrons & holes in semiconductor material is given by- $I_{drift}=e\,(\mu_n n + \mu_p p)E$ **[7]**

    b)   With the help of neat diagram explain the construction and working of heterojunction bipolar transistor.   **[5]**

Q3) Attempt the following questions.

    a)   What is schrodinger wave equation? Derive time independent schrodinger equation for a free particle. Write applications of schrodingers wave equation for bound state potential problems.   **[7]**

    b)   Explain Hybrid-pi model of BJT using neat circuit diagram.   **[5]**

Q4) Attempt the following questions.

a) Discuss in detail the effect of temperature on Fermi-Dirac distrubution function. **[7]**

b) Explain semiconductor materials on the basis of their types, material types and applications. **[5]**

Q5) Attempt the following questions.

a) What is Hall effect? With the help of geometry for measuring the hall effect, explain Hall voltage and Hall coefficient. Discuss the value of Hall voltage for n type and p type semiconductor. **[7]**

b) Explain the ideal current-voltage relation for n channel MOSFET for

i) Depletion mode and **[5]**

ii) Enhancement mode

Q6) Attempt the following questions.

a) List the various bipolar transistor structures. Explain the principle and working of polysilicon emitter BJT with the help of suitable diagram.**[7]**

b) Write a difference between avalanching and zener process. Comment-"zener diode is always working in reverse bias mode for voltage regulator"

[5]

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

a) How p-n junction is formed? what is meant by a built in potential barrier and how it is important? List different types of diode.

b) Write a note on-Intrinsic and extrinsic semiconductors. List the examples of intrinsic & extrinsic semiconductor.

c) Write a difference between JFET and MOSFET. Comment-"FETs are unipolar device".

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[5838]-204

M.Sc. (Part - I)

ELECTRONIC SCIENCE

ELDT-124: Fiber Optic Communication Systems (Paper - IV)

(2019 Pattern) (CBCS) (Semester - II) (Elective - II) (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 2 to 5 carry equal marks.*

Q1) Solve any five of the following :

a) What are the two modes of laser welding process? **[1]**

b) What is the need of optical couplers in fiber optics? **[1]**

c) Define an integrated optics. **[1]**

d) List the types of dispersion in fiber optic cables. **[1]**

e) What is line code in optical links? **[1]**

f) Define OTDR in fiber optic system. **[1]**

Q2) Answer the following :

a) i) What is meant by attenuation in optical fiber cable? List its different types. **[2]**

ii) Explain the function and principle of operation of wavelength converters. **[4]**

b) The system contains the transmitter and receiver, the optical link contains optical amplifier, 4 optical connectors, and 5 splices, transmitter power = 3dBm, connector loss = 0.15dB, splice loss = 0.15dB, amplifier gain = 10dB and fiber optic loss = 0.2 dB/km. Calculate the total attenuation of this optical link. **[4]**

P.T.O.

Q3) Answer the following :

   a) i)   Mention the critical elements involved in calculating power budget.**[2]**

       ii) Explain the eye pattern in optical fiber communication.   **[4]**

   b) Explain the working of EDFA optical amplifier. Derive its gain expression.
                                                                            [4]

Q4) Answer the following :

   a) i)   What is WDM in optical fiber communication.   **[2]**

       ii) Explain the function of optical switches.   **[4]**

   b) A fiber link has following data :   **[4]**

Component	BW Rise	Time (tr)
Transmitter	200 MHz	1.75 nsec
LED (850 nm)	100 MHz	3.50 nsec
Fiber cable	90 MHz	3.89 nsec
PIN detector	350 MHz	1.00 nsec
Receiver	180 MHz	1.94 nsec

   Compute the system rise time and band width.

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

   a) Beam splitter   **[2½]**
   b) Optical isolators   **[2½]**
   c) Optical time Domain Reflectometer   **[2½]**
   d) Point to point link   **[2½]**
   e) Link power budget   **[2½]**
   f) Dispersion in multimode optical fiber cable   **[2½]**

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P532

[5838]-204
M.Sc. (Part - I)
ELECTRONIC SCIENCE
ELDT-124 : Fundamentals and Applications of AVR Microcontroller
(2019 Pattern) (CBCS) (Semester - II) (Elective - II) (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) Answer any five of the following :   **[5 × 1 = 5]**

a) Write the pin function of SCL and SDA pins of AVR microcontroller.

b) Which flag bit of status register updated when BLD and BST instruction executed in AVR microcontroller.

c) State the bit capacity of timer registers present in AVR micro controller.

d) Name the current driver IC used to interface DC motor with AVR microcontroller.

e) How many number of steps are required for stepper motor to complete on revolution if step angle is 1.8 degree?

f) In AVR microcontroller what is the ISR address for an hardware interrupt?

Q2) Answer the following :

a) Draw the DAC interfacing diagram with AVR microcontroller and write 'C' program code for square wave.   **[6]**

b) Draw and explain architecture block diagram of AVR microcontroller.

                                                      [4]

Q3) Answer the following :

a) i) Write the meaning of the following instructions. **[2]**
   a) BCLR b) CBR
   c) CPC d) DEC

ii) For an 10-bit ADC, we have V_{ref} = 5V. Calculate the Do-Da digital output if the analog inputs is **[4]**
   a) 2.8V b) 3.5V

b) Describe registers associated with input output ports of AVR microcontroller. **[4]**

Q4) Answer the following :

a) i) What are the addressing modes of AVR microcontroller? **[2]**

ii) Name in which seven segment display IC 7447 used as seven segment decoder driver? Draw a seven segment display interfacing diagram with AVR microcontroller. **[4]**

b) Write an assembly language program to convert 47 packed BCD into ASCII numbers. **[4]**

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

a) The X-register, Y-register and Z-register of AVR microcontroller.

b) Features of AVR microcontroller.

c) Modes of I^{2}C (inter-integrated circuit) serial protocol.

d) Status Register of AVR microcontroller.

e) Real Time Clock (RTC) DS1307.

f) Memory organization of AVR microcontroller.

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[5838]-301

M.Sc. - II

ELECTRONIC SCIENCE

ELT231 : Advanced Communication Systems (Paper - I)

(2019 Pattern) (CBCS) (Semester - III) (Credits - 4)

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) *Questions 2 to 7 carry equal marks.*

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

a) Describe any two applications of Geostationary satellite in short.

b) Explain atmospheric Noise.

c) Define the following terms :

   i) SDLC protocol

   ii) Noise figure

d) "FM is less Noisy than AM" comment.

e) Calculate the frequency deviation of FM signal with modulating frequency of 5kHz & modulation index of 0.5.

f) A receiver has an input signal power of 1 mW. The Noise power is 0.35 mW. Calculate the signal to Noise ratio.

Q2) a) Describe the sky wave propagation with the help of diagram.   **[4]**

b) Draw the block diagram of Amplitude Shift Keying (ASK). Explain it in short.   **[4]**

c) Draw the block diagram of cellular radio system. Explain it in short. **[4]**

Q3) a) With the help of diagram, explain the working of Adaptive delta modulation and write it's advantages over delta modulation. **[4]**

b) With the help of diagram, explain the working of Yagi Uda Antenna. **[4]**

c) Equation for FM wave is e = 12 cos(6×10^8t + 5 sin 1250t) find the carrier frequency, modulating frequency, modulation index & maximum deviation. **[4]**

Q4) a) With the help of neat diagram, explain the working of diode detector circuit used for AM signal. **[4]**

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

c) Write a difference between ungrounded & grounded antenna. **[4]**

Q5) a) Draw the diagram of parabolic reflector antenna & explain it in short and write the features of it. **[4]**

b) Describe the folded Dipole antenna. Write it's applications. **[4]**

c) An amplifier operating over the frequency range from 18 to 20 MHz has a 10KΩ input resistance. Find the r.m.s. Noise voltage at the input to this amplifier if the ambient temperature is 17ºC. **[4]**

Q6) a) State Kepler's three Laws. **[4]**

b) State SDLC protocol. Draw the SDLC frame format and explain the function of each field in short. **[4]**

c) In AM transmitter carrier power is of 500 watts & modulation 80%. Calculate power in each sideband and also calculate the total power. **[4]**

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

a) Write short note on TDMA and FDMA. **[6]**

b) Draw the block diagram of FDM explain in brief. **[6]**

c) Explain the effect of ground on antenna. **[6]**

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[5838]-302

M.Sc. (Part - II)
ELECTRONIC SCIENCE
ELT232 : Mechatronics and Robotics
(2019 Pattern) (Semester - III) (Credit - 4) (Theory)

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

Instructions to the candidates :

1) *Qusetion 1 is compulsory.*
2) *Solve any five questions from Q2 to Q7.*
3) *Figures to the right indicates full marks.*
4) *Neat diagram must be drawn wherever necessary.*
5) *Use of calculator is allowed.*

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

a) What is mean by mechatronics system?

b) Define AC motors.

c) What is mean by electrical building block?

d) What is system models?

e) What is gears?

f) What is line and circular motion?

Q2) Attempt the following :

a) i) Write any three applications of Robot.   **[3]**

    ii) Draw structure and explain BJT as a solid state switch. **[4]**

b) Draw and explain DC motor.   **[5]**

Q3) Attempt the following :

   a)   i)   What is second order system? Give it's example.   **[3]**

         ii)   Explain angular velocity and angular acceleration.   **[4]**

   b)   Write any five applications area of Robotics in brief.   **[5]**

Q4) Attempt the following :

   a)   i)   What is rotational and translation motion.   **[3]**

         ii)   Explain Homogenous transformation matrices.   **[4]**

   b)   Explain axis / angle representation in arbitrary rotation.   **[5]**

Q5) Attempt the following :

   a)   i)   What is mean by trajectory planning?   **[3]**

         ii)   What is relay? Explain it's construction and working.   **[4]**

   b)   Explain degree of freedom.   **[5]**

Q6) Attempt the following :

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

         ii)   Explain PMDC motor.   **[4]**

   b)   Explain Euler-Lagrange equation by forming Lagrangian of a system.   **[5]**

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

   a)   MOSFET as switch

   b)   Roll-pitch-yaw representation

   c)   Mechanical building blocks.

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[5838]-303

M.Sc. (Part - II)
ELECTRONIC SCIENCE
ELT 233 : Control Systems
(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.*

    3)   *Use of Non-programmable calculator is allowed.*

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

    a)   What is derivative overrun?

    b)   List the advantages of frequency response analysis over the root locus technique.

    c)   Sketch the output of PID controllers for a step input.

    d)   List the information that should be contained in a P and ID.

    e)   Distinguish the open loop and closed loop control system.

    f)   Determine the transfer function of Low Pass Filter (RC).

Q2) Answer the following :

    a)   What is SCADA? Explain the architecture with details.   **[7]**

    b)   Determine the range of K for stability of unity feedback system whose open loop transfer function is $G(s) = \dfrac{k}{s(s+1)(s+2)}$.   **[5]**

Q3) Answer the following :

a) Explain the application of control system in paper tension control system for winding. **[7]**

b) Draw graph of PI controller output as a function of time $K_p = 5$, $K_I = 1.0s^{-1}$ and $P_I(0) = 20\%$. When input is in the following form. **[5]**
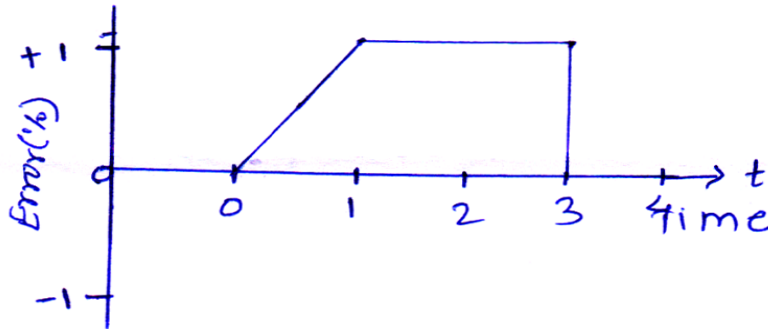

Fig Q.3 b)

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) What are minimum area and quarter amplitude criteria for control system evaluation? **[5]**

Q5) Answer the following :

a) Explain two position control system. Develop it for following system
   Level measurement in a sump tank is provided by a transducer scaled as 0.2 v/m. A pump is to be turned on by application of +5V when the sump level exceeds 2.0m. The pump is to be turned back off when the sump level drops to 1.5m. **[7]**

b) Explain the concept of block diagram of control system with suitable examples. State its advantages and limitations. **[5]**

Q6) Answer the following :

a) What is root locus? State the essential condition which every point on root locus has to satisfy. Consider open loop transfer function **[7]**

$$G(s)H(s) = \frac{k}{s(s+2)}$$

i) Find $S = -1 + j$ and $S = 3j$ on root locus?

ii) If so, what is the corresponding value of K?

b) Explain the application of control system for speed control of dc motor. **[5]**

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

    a)   Fuzzy logic controller.

    b)   Multi position controller.

    c)   Standard graphics symbol for process control and Instrumentation.

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[5838]-304
M.Sc. (Part - II)
ELECTRONIC SCIENCE
ELT234 : Wireless Communication System - I
(2019 Pattern) (CBCS) (Semester - III) (Credits 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) *Question 2 to 5 carry equal marks.*

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

    a) Define RFID. **[1]**

    b) Define CDMA. **[1]**

    c) Define WLAN. **[1]**

    d) Give the full form of MIMO. **[1]**

    e) Give the full form of OFDM. **[1]**

    f) Give the functions of RAKE Receiver. **[1]**

Q2) a)   i)   What is cognitive Radio (CR)? **[2]**

       ii)   Write a Note on concept of spread spectrum. **[4]**

    b) Give any four examples of wireless communication system. **[4]**

Q3) a)   i)   What is mean by GPRS? **[2]**

       ii)   Write a note on spectrum sharing. **[4]**

    b) Write a note on soft hand off. **[4]**

Q4) a) i) What is PAN? [2]

ii) Write a note on paging system. [4]

b) Write a note on GSM speech coding. [4]

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

a) Hand over.

b) Air Interface.

c) Authentication & security in GSM.

d) CDMA 2000 cellular technology.

e) IS 95 CDMA system Architecture.

f) Diversity multiplexing trade-off.

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[5838]-304
M.Sc. (Part - II)
ELECTRONIC SCIENCE
ELT234 : Fundamentals of Internet of Things
(2019 Pattern) (CBCS) (Semester - III) (Credits 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)   *Questions 2 to 5 carry equal marks.*

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

   a)   What is Internet of things?

   b)   List two applications of IOT.

   c)   What is ITU-T?

   d)   What is long form of RFID?

   e)   Define WSN.

   f)   What is EPCIS?

Q2) a)   i)   Define QOS. Why it is important?   **[2]**

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

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

Q3) a)   i)   What is ONS? why it is use?   **[2]**

         ii)   Write a note on Web of things.   **[4]**

   b)   List any four security issues related to WSN.   **[4]**

         P.T.O.

Q4) a) i) What is Networking Nodes. **[2]**

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

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

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

a) ITV-Views.

b) Device Intelligence.

c) IOT Architecture.

d) RFID Design issues.

e) RFID Security.

f) Routing Protocols.

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[5838]-401

M.Sc. (Part - II)
ELECTRONIC SCIENCE
ELT 241 : PLC Programming and applications
(2019 Pattern) (Credit System) (Semseter - IV) (Credit - 2)

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

Instructions to the candidates:

1) *Q. 1 is compulsory.*
2) *Solve any five questions from Q. 2 to Q.5.*
3) *Figures to the right side indicate full marks.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Use of Non-programmable calculator is allowed.*

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

a) List any three output instructions.

b) Which bit of down counter is set when it counts below - 32768?

c) What are the two most common types of PLC programming devices?

d) What is the standard programming language used with PLCs?

e) Each integer file has how many elements?

f) Which instruction is used to reset the counter.

Q2) Answer the following questions :

a) i) Explain on - Delay timer instruction in detail. **[3]**

ii) List different PLC manufacturers and explain PLC programming language Instruction List. **[3]**

b) Explain the major function of following major components of PLC **[4]**

i) Processor

ii) I/O module

iii) Programming device

iv) Power supply module.

P.T.O.

Q3) Answer the following questions :

a) i) Explain Down counter instruction in detail **[3]**

ii) Explain equal and less than equal instructions in detail. **[3]**

b) Draw the ladder diagram for following sequence : **[4]**

i) If push button PB1 is pressed, the red light turns ON.

ii) If push button PB2 is pressed, the green light turns ON.

iii) If both the buttons [PB1 and PB2] pressed at once, neither light turns ON.

Q4) Answer the following questions :

a) i) Explain with the suitable diagram the optical isolator circuit used in discrete I/O module. **[3]**

ii) List three examples of discrete output devices and three field devices that are commonly by PLC analog output module. **[3]**

b) Draw the ladder diagram for switching three motors off one by one at 5s interval when STOP push button in pressed. **[4]**

Q5) Answer any FOUR questions : **[2½ × 4 =10]**

a) Compare the function of PLC program and data files.

b) Write a note on Functional Block Diagram (FBD).

c) Write a note on modular PLC.

d) State advantages of PLCs over electromagnetic relays.

e) Write a note on MOV instruction.

f) Draw the ladder diagram for NOT gate and NOR gate.

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[5838]-402
M.Sc. (Electronic)
ELDT 243 : TECHNICAL WRITING
(CBCS) (2019 Pattern) (Semester - IV) (Paper - 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)   *Question 2 to 7 carry equal marks.*

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

    a)   Write the purpose of theme presentation.

    b)   What is communication?

    c)   List the characteristics of reports.

    d)   Write any two points that must be kept in mind while summarizing the discussion.

    e)   List any four types of reports.

    f)   What is the purpose of technical written communication?

Q2) a)   Explain in brief the barriers to communication.   **[7]**

    b)   Write in the major parts involved in writing a technical report.   **[5]**

Q3) a)   Give in brief some tips for presentation.   **[7]**

    b)   Give the reasons for conducting a group discussion.   **[5]**

Q4) a)   Write a job application letter to a pune based company for the post of Assistant Engineer.   **[7]**

    b)   Discuss the flow of communication.   **[5]**

Q5) a)   Which Do's and Don'ts one should follow in a group discussion. **[7]**

    b)   What is body language? How do the physical movements of the body help in communication?   **[5]**

Q6) a) What is the need of audience analysis in a the matic presentation? **[7]**

b) Discuss the different techniques to initiate a group discussion and write any two techniques in detail. **[5]**

Q7) Write short note Any Two.

a) What is paragraph? Write the kind of sentences that are necessary in a paragraph. **[6]**

b) Describe the five steps of structuring a report. **[6]**

c) What is the conference? Detail the purpose of conference. **[6]**

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