Total No. of Questions : 7]

SEAT No. :

PD3545

[Total No. of Pages : 2

[6484]-11

M.Sc. - I

ELECTRONIC SCIENCE

ELUT 111 : Mathematical Methods in Electronics Using C

(2019 Pattern) (Semester-I)

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

Instructions to the candidates:

1) ***Question No.1 is compulsory.***
2) ***Solve any five questions from Q.2 to Q.7.***
3) ***Question 2 to 7 carry equal marks.***
4) ***Non-programmable calculator is allowed.***

Q1) Solve any Five of the following.

a) What is mean by periodic signal? **[2]**

b) What is ordinary equation of order two? **[2]**

c) Draw pole-zero diagram for given network function **[2]**

$$F(s) = \frac{3s}{(s+2)(s+3)}$$

d) Define Z-transform for discrete time signal. **[2]**

e) What is the difference between a++ and ++a in C programming. **[2]**

f) What is mean by linear differential equation? **[2]**

Q2) Answer the following.

a) i) In Cartesian co-ordinate system, the co-ordinate of point Q are (10, 15, 20). Determine equivalent co-ordinates of cylindrical and spherical co-ordinates system. **[4]**

ii) What are basic types of differential equations (DE)? Give an example of each DE. **[3]**

b) Determine the Laplace Transform (L.T.) of **[5]**

i) $\delta(t)$

ii) $u(t)$

P.T.O.

Q3) Answer the following.

a) i) Explain Routh Hurwitz criteria. **[3]**

ii) Determine the stability of characteristic equation **[4]**

$$s^4 + 2s^3 + 3s^2 + 4s + 5 = 0$$

b) Write a C program to find a factorial value of an integer provided by user. **[5]**

Q4) Answer the following.

a) State initial value theorem. Find the initial value for function **[7]**

$f(t) = 2u(t) + 3\cos u(t)$

b) Write Bessel's differential equation. Write any four applications of Bessel's equation. **[5]**

Q5) Answer the following equations.

a) i) Explain user defined function and library function with example of each **[3]**

ii) Find the convolution of $f(t) = e^{-t}$ & $g(t) = \sin(t)$ **[4]**

b) Explain Null pointer with example. Also, list types of pointers in C. **[5]**

Q6) Answer the following equations.

a) i) Write any four points on difference between structure and union. **[4]**

ii) What are the order and degree of differential equations? Explain first order linear differential equation with example. **[3]**

b) Explain Linearity property of Z-transform with region of conversion (ROC) **[5]**

Q7) Answer any two of the following.

a) i) Explain "Call by Reference" method **[3]**

ii) What are the advantages of using pointer in C? **[3]**

b) i) Write a short note on Transfer function in s-domain for first order Butterworth High pass filter using OP-AMP. **[3]**

ii) Write a short note on Linearity property of Laplace Transform. **[3]**

c) i) Write a short note on homogenous and non-homogenous differential equation with example. **[3]**

ii) Write a short note on impulse function. **[3]**

Total No. of Questions : 7]

SEAT No. : ____

PD3546

[Total No. of Pages : 2

[6484]-12
M.Sc. - I
ELECTRONIC SCIENCE
ELUT-112: Analog Circuit Design
(2019 Pattern) (Semester - I)

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

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Attempt any five questions from question 2 to 7.***
3) ***Questions 2 to 7 carry equal marks.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non-programmable calculator is allowed.***

Q1) Attempt any Five of the following. **[10]**

a) What is distortion in amplifier? State types of it.

b) Define CMMR and slew rate in an OPAMP.

c) Determine forward resistance of PN junction diode when forward current is 5mA at T = 300 K.

d) What are merits and demerits of phaseshift oscillator?

e) Draw an equivalent circuit of an OPAMP.

f) Identify the circuit given below. Determine $V_0(t)$ for circuit for the given sinusoidal input signal.

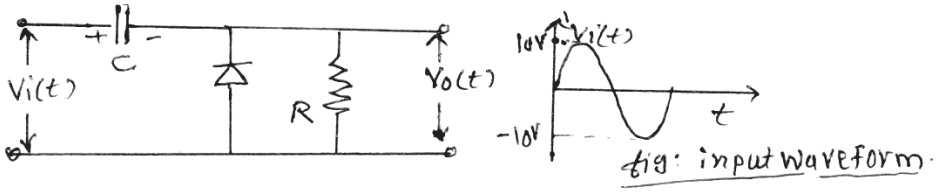

fig: input waveform

Q2) Attempt the following.

a) What is MOSFET? Explain construction and the working of Enhancement MOSFET and Depletion MOSFET. **[7]**

b) Derive equation for voltage gain, current gain, input impedance and output impedance for BJT using the approximate h- parameter model for CB configuration. **[5]**

Q3) Attempt the following.

a) Explain working of R_C coupled amplifier by using potential divider biasing. Find the value of R_1, R_2, R_c and R_E assume V_{cc} = 10V and I_c = 4mA.**[7]**

b) What are active filter? What are their advantages over passive filter? Design first order high pass active filter with cutoff frequency 1KHz and pass band gain of 2. **[5]**

P.T.O.

Q4) Attempt the following.

a) With the neat circuit diagram, explain working principle of colpitts crystal oscillator. A crystal has the following parameters L = 0.5H, C_s = 0.06 PF, C_p = 1PF and R = 5KΩ. Find the series and parallel resonant frequencies and Q factor of the crystal. **[7]**

b) An OPAMP is to be used in the inverting feedback configuration with a closed loop signal gain of 100 and an input resistance of 10KΩ.

i) Assuming ideal amplifier performance what values of input feedback resistor should be used?

ii) If the OPAMP is assumed ideal except for a finite loop gain of 10^4 by how much will the signal gain differ from 100?

iii) If the open loop gain of the amplifier changes by 5 percent what effect will this have on the closed loop signal gain? **[5]**

Q5) Attempt the following.

a) What are multistage amplifier? Explain different coupling scheme using amplifiers with diagram. **[7]**

b) Draw block diagram of PLL and explain function of each block. With block diagram explain it is used as frequency multiplier. **[5]**

Q6) Attempt the following.

a) Discuss the comparison of single tuned, doubled tuned and stagger tuned amplifiers. A tank circuit has a capacitor of 100 PF and an inductor of 100 μH. The resistance of the inductor is 5Ω, Determine **[7]**

i) resonant frequency

ii) impedance at resonance

iii) Q factor

iv) Bandwidth

b) What are waveshaping circuit? Explain any one waveshaping circuit in detail. **[5]**

Q7) Attempt any two of the following.

a) Explain breakdown in PN junction diode. **[6]**

b) Describe types of oscillators. State and explain Barkhausen criteria for oscillation. **[6]**

c) Write a short note on frequency compensation for OPAMP. **[6]**

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Total No. of Questions : 7]

SEAT No. : ____

PD3547

[Total No. of Pages : 2

[6484]-13
M.Sc. - I
ELECTRONIC SCIENCE
ELUT-113: Digital System Design
(2019 Pattern) (Credit System) (Semester - I)

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

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Attempt any five questions from 2 to 7.***
4) ***Use of nonprogrammable calculator is allowed.***

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

a) Draw excitation table for JK flipflop.

b) Write verilog code for half subtractor using data flow modeling.

c) Define Module and Port in verilog language.

d) Distinguish between VHDL and VERILOG language.

e) Write verilog code for the following diagram.

f) Define delay based and event based timing control.

Q2) Answer the following.

a) i) Design 4 bit ALU and write verilog code by using case statement. **[4]**

ii) Implement the following using PLA **[3]**

$f_1 (x, y, z) = \Sigma m (0, 2, 4, 5)$

$f_2 (x, y, z) = \Sigma m (2, 4, 6, 7)$

b) State and explain different operators and data types of verilog with suitable example. **[5]**

P.T.O.

Q3) Answer the following.

a) Design 4 bit binary to Gray converter. Write its verilog code using Behavioral modeling. **[7]**

b) Write verilog module for half adder and design full adder. Write verilog code for full adder using behavioral modeling. **[5]**

Q4) Answer the following.

a) i) Design 8 : 1 multiplexer. **[3]**

ii) Write verilog code for 4 : 1 multiplexer using data flow modeling and conditional operators. **[4]**

b) Design stepper motor control system using FSM in verilog. **[5]**

Q5) Answer the following.

a) i) Draw and explain 8 bit magnitude comparator using 4 bit magnitude comparator using IC 7485. **[4]**

ii) State the difference between function and Task in verilog. **[3]**

b) Write state table and verilog module for T-flipflop. Write verilog code for J-K flipflop using behavioral modeling. **[5]**

Q6) Answer the following.

a) i) Design and write verilog code for 4-bit parallel in - serial out (PISO) shift register. **[4]**

ii) Develop verilog code for 4 bit down counter. **[3]**

b) Design sequence generator using T-filpflop to generate 1 – 3 – 5 – 7 – 2 – 1 – 0 sequence. **[5]**

Q7) Answer any two of the following.

a) Draw and explain architecture of FPGA. Write the procedure to design digital system using CPLD. **[6]**

b) Explain in brief Mealy and More state machine. **[6]**

c) Draw schematic of SRAM cell. Explain read and write operation of SRAM with the help of diagrams. **[6]**

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Total No. of Questions : 5]

SEAT No. : ____

PD3548

[Total No. of Pages : 4

[6484]-14
M.Sc. - I
ELECTRONIC SCIENCE
ELDT 114 : Basics of Optical Fiber Communication
(2019 Pattern) (CBCS) (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) ***Draw neat diagrams wherever necessary.***

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

a) Define Skew ray.

b) State different types of fiber optic cable.

c) What is step index fiber?

d) What is the difference between splice and connector?

e) Write the snell's law.

f) State the advantages of fiber optic communication.

g) What is group velocity?

Q2) a) Attempt any two of the following. **[6]**

i) Explain the construction of slotted core cable.

ii) Explain the acceptance angle with the help of neat ray diagram.

iii) What are the fiber bending lossess? Explain.

b) Draw and explain the optical receiver with common source FET preamplifier circuit. **[4]**

P.T.O.

Q3) a) Attempt any two of the following. **[6]**

i) Explain the role of regenerative repeators in fiber optic communication.

ii) What is step index fiber? Explain multimode step index fiber.

iii) Explain attenuation loss in optical fiber.

b) A typical relative R.I. difference for an optical fiber designed for long distance transmission is 1%. Estimate the N.A. and the solid acceptance angle in air for fiber core index 1.46. Calculate critical angle core - cladd interface within fiber. **[4]**

Q4) a) Attempt any two of the following. **[6]**

i) Explain the intrensic and extrensic losses in optical fiber.

ii) Explain expanded beam type connector.

iii) Derive and explain the equation of numerical aperture.

b) A multimode fiber with a core R.I. of 1.500, a relative R.I. difference of 3% and operating wavelength of 0.82 μm. Calculate the radius of curvature.**[4]**

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

a) What is dispersion? Explain the intermodal dispersion.

b) What is driver circuit? Explain any analog driver circuit for LED.

c) State the splices types and explain any one in brief.

d) Explain microbending loss in optical fiber.

e) Write advantages and disadvantages of optical fiber communication.

f) What is chromatic dispersion? How material creates chromatic dispersion?

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Total No. of Questions : 5]

PD3548

[6484]-14
M.Sc. - I
ELECTRONIC SCIENCE
ELDT 114 : Fundamentals and Applications of PIC Microcontrollers
(2019 Pattern) (CBCS) (Semester - I)

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

Instructions to the candidates:

1) ***Q1 is compulsory.***
2) ***Attempt any three questions from Q.2 to Q.5.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Use of non programmable calculator is allowed.***

Q1) Attempt any five of the following.

a) Write the syntax of ADDWF instruction. **[1]**

b) Enlist the addressing modes of PIC18 microcontroller. **[1]**

c) Write the syntax of BTFSC instrction. **[1]**

d) How much data RAM space does PIC 18FXX have. **[1]**

e) Which register holds the OV flag? **[1]**

f) Of the 4096 bytes of RAM, in the PIC18, how many bytes are bit addressable. **[1]**

Q2) Answer the following.

a) Attempt any one of the following.

i) Explain in detail the features of RISC architecture. **[6]**

ii) Explain in detail the PIC18 status register. **[6]**

b) Differentiate between 8051 and PIC18 microcontroller. **[4]**

Q3) Answer the following.

a) Attempt any one of the following.

i) A switch is connected to pin RD7. Draw a neat labelled diagram to perform stepper motor interfacing with PIC18 microcontroller. Also explain the difference between unipolar and bipolar stepper motor.**[6]**

ii) Explain in detail the addressing modes of PIC18 microcontroller with suitable example. **[6]**

b) Write a C18 program to send values 00 to FF to PortB. **[4]**

Q4) Answer the following.

a) Attempt any one of the following.

i) Explain 16 bit timer programming. Write down the steps to program Timer 0 in 16-bit mode. Also draw the Timer 0 16 bit block diagram. **[6]**

ii) Differentiate between CCP and ECCP of PIC18 microcontroller. **[6]**

b) Write a C18 program to convert packed BCD 0×29 to ASCII and display the bytes on PORT B and PORT C. **[4]**

Q5) Attempt any four of the following.

a) Describe the importance of pipelining in PIC18 microcontroller. **[2½]**

b) Write on an assembly language program to find the smaller of two values 27 and 54 and place it in file register location 0×20. **[2½]**

c) Enlist the pins of DB9 connector. **[2½]**

d) Describe the function of OSCEN pin of PIC18 microcontroller. **[2½]**

e) Draw the circuit diagram for 2digit multiplexed SSD interfacing with PIC18 microcontroller. **[2½]**

Total No. of Questions : 7]

SEAT No. :

PD3549

[Total No. of Pages : 2

[6484]-21

M.Sc. - I

ELECTRONIC SCIENCE

ELUT-121 : Applied Electromagnetics, Microwaves and Antennas

(CBCS 2019 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***Question No. 1 is compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Attempt any five questions from question 2 to question 7.***
4) ***Question 2 to question 7 carry equal marks.***
5) ***Use of non-programmable calculator is allowed.***

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

a) State the maxwell's equations in the frequency domain.

b) What is normalized impedance? Explain how it is derived in the transmission line.

c) Show that characteristics impedance of air/vacuum medium is 377Ω.

d) A standard air-filled rectangular wave guide with dimensions a = 8.636cm, b = 4.318cm is fed by a 4 GHZ carrier from a coaxial cable. Determine whether a TE_{10} more will be propagated.

e) What is beam with and radiation pattern of an antenna?

f) What is retarded potential?

Q2) Attempt the following questions.

a) Starting with maxwell's equations derive wave equation for electric field and magnetic field. Write the wave equation for non-conducting medium. **[7]**

b) What is waveguide? Write the formula for cut-off frequency and phase velocity for TM mode of rectangular waveguide and explain each term in it. **[5]**

Q3) Attempt the following questions :

a) What is magnetron oscillator? Using neat diagram explains the working principle of magnetron oscillator. Write the applications of magnetron oscillator. **[7]**

b) Explain TM mode in rectangular wave guide show than TM01 and TM10 modes in rectangular waveguide do not exist. **[5]**

P.T.O.

Q4) Attempt the following questions.

a) Explain the optic fiber principle and working using neat, diagram. Compare conducting circular waveguide and optic fiber. **[7]**

b) A magnetic field strength of 5μA/m is required at a point on $\theta = \frac{\pi}{2}$, which is 2 km away from on antenna in air. How much power must a Hertzian dipole transmit of length λ/25?

Hint : Use $|H\phi S| = \frac{Io\beta dl \sin\theta}{4\pi^2}$ and prad = $40\pi^2 \left[\frac{dl}{\lambda}\right]^2 Io^2$. **[5]**

Q5) Attempt the following questions :

a) What is reflection coefficient and VSWR in a transmission line? A transmission line has $Z_0 = 50 + j0.01\Omega$. and $Z_1 = 73 - j42.5\Omega$. Find a reflection coefficient and standing wave ratio. **[7]**

b) Enlist the types of antenna. Explain any two of types of antenna in brief. **[5]**

Q6) Attempt the following questions :

a) Using the circuit theory derive transmission line wave equation. A uniform transmission line has constants K = 12m Ω/m, G = 0.8μΩ/m, L = 1.3μH/m and C = 0.7nF/m at 5KHz frequency. Find its characteristics impedance. **[7]**

b) With neat diagram explain Gunn effect diode. Write the applications of Gunn diode. **[5]**

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

a) What is smith chart? Write a note on importance of smith chart in solving transmission line problems.

b) Explain skin effect in conducting medium of electromagnetic wave propagation.

c) Write a note on cavity resonator and Q-factor of cavity resonator.

Total No. of Questions : 7]

SEAT No. : ____

PD3550

[Total No. of Pages : 3

[6484]-22

M.Sc. - I

ELECTRONIC SCIENCE

ELUT122 : Instrumentation and Measurement Techniques

(2019 Pattern) (Credit System) (Semester -II)

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

Instructions to the candidates:

1) ***Figures to the right indicates full marks.***
2) ***Question 1 is compulsory.***
3) ***Attempt any Five questions from question 2 to question 7.***
4) ***Question 2 to questioin 7 carry equal marks.***
5) ***Use of non-programmable calculator is allowed.***

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

a) What is strain gauge? State the different types of strain gauge.

b) Define transducer. Write any two advantages of active transduce over passive transducer.

c) List any four displacent measuring transducer state application of measuring transducer

d) Comment-'transducers can be work as a sensor.

e) A meter reads 127.50V and true value of the voltage is 127.13V

Find

i) Static error &

ii) The static correction for this instrument

f) A wheat stone bridge requires a change of 7Ω in the unknown arm of the bridge to produce a change in deflection of 3mm of the galvanometer. Determine the sensitivity & scale factor.

Q2) Attempt the following questions.

a) i) With the help of neat block diagram explain the generalized measurement system. **[4]**

ii) Explain the working principle of McLeod gauge. **[3]**

b) List the various static characteristics of measurement system. Explain any two static characteristics of measurement system. Explain how dynamic characteristic different than static characteristics. **[5]**

P.T.O.

Q3) Attempt the following questions.

a) Explain the step, ramp and frequency response of second order system using suitable examples. **[7]**

b) With the help of neat diagram explain **[5]**

i) Digital displacement transducer and

ii) Ultrasonic transducer

Q4) Attempt the following questions.

a) i) Explain the working and construction of LVDT with the help of suitable example explain how LVDT transducer used as a displacement tarnsducer. State the advantages & disadvantages of LVDT transducer. **[4]**

ii) A thermometer has time constant of 3.5 sec. It is quickly taken from 0°C to a water bath of temperature of 100°C. What the temperature will be indicated by the thermometer after 1.5 sec. **[3]**

b) What is error? State the types of error involved in measurement. A wattmeter having the range of 500 w has an error of ±1% of FSD, if the true value of power is 50W. What Would be the range of reading if the error is specified at the % of the true value, what would be the range of the reading . **[5]**

Q5) Attempt the following questions.

a) Define the loading effect. Write the importance of input and output impedance of measurement system. Explain the loading effect due to series and shunt connected to the instrument. State the condition impose on the measuring the instrument to minimize the loading effect. [**7]**

b) Discuss strain gauges. A compressive force is applied to a structural member the strain is 5 microstrain two separate the strain gauge are attached two the structural member, one is nickel wire strain gauge having gauge factor of –12.1 and other is nichrome wire strain gauge having gauge factor of 2. Calculate the value of resistance of gauges after they are strained. The resistance of strain gauges before being strained is 120 Ω. [**5]**

Q6) Attempt the following questions.

a) List different types of methods of flow measurement. Explain the working of

i) Electromagnetic flowmeter

ii) Ultrasonic flowmeter

An electromagnetic flow meter is used to measure the average flow rate of an effluent in a pipe of 50 mm diameter. The velocity profile is symmetrical and can be assumed uniform. The flux density in the liquid has a peak value of 0.1 wb/m^2, the output from the meter electrodes is taken to an amplifier of gain 1000, the impedance between the electrode is 250kΩ and input impedance of meter is 250 mΩ. Find the effluent average velocity when peak to peak voltage at the amplifier output is 0.2 V. **[7]**

b) With the help of suitable examples explain null type and deflection type Instruments. State Advantages of null type & deflection types instruments. **[5]**

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

a) Give the defination and significance of measurement. Explain in brief machanical and Electronic instruments. **[6]**

b) List the temperature transducers. Explain with circuit diagram of three wire and four wire methods. of temperature measurement using RTD. state Features of LM 35. **[6]**

c) Explain the working of piezoelectric transducers. State different types of modes of operations of piezoelectric transducers. Write the properties of materials of piezoelectric transducers. Give advantage & application of it. **[6]**

Total No. of Questions : 7]

SEAT No. : [ ]

PD3551

[Total No. of Pages : 2

[6484]-23
M.Sc. - I
ELECTRONIC SCIENCE
ELUT-123: Foundation of Semiconductor Devices
(2019 Pattern) (Semester - II) (Credit System)

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

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Question 2 to question 7 carry equal marks.***
4) ***Solve any five questions from question 2 to question 7.***

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

a) Define following terms in relation to Crystalline solids

i) Unit Cell &

ii) Coordination number

b) How does temperature affect on a semiconductor band gap?

c) What is meant by quasi fermi level.

d) "The breakdown voltage of a p-n junction decreases as the doping concentration increases". - Comment.

e) What are degenerate semiconductor. Draw energy diagram of n type degenerate semiconductor materials.

f) To Calculate the de Broglie wavelength of a particle. Consider an electron traveling at a velocity 10^5 m/s. ($h = 6.625 \times 10^{-34}$).

Q2) Attempt the following questions:

a) Explain the concept of density of state. Obtain the expression for density of state in solid. Explain qualitatively density of allowed electronic energy state in conduction band and valance band of semiconductor material. **[7]**

b) What is Fermi level? Explain the effect of doping & temperature on fermi level. **[5]**

Q3) Attempt the following questions:

a) State the statistical laws used for explaning behavior of particles. Obtain an expression for Fermi-Diac distribution function. Explain its dependance on temperature. **[7]**

b) Define packing fraction. Calculate the packing fraction of aluminum. **[5]**

P.T.O.

Q4) Attempt the following questions:

a) i) Silicon at T = 300 ºK is uniformly doped with phosphorus atoms at a concentration of 2×10^{16} cm. A Hall effect device has been fabricated with the following geometry: d = 10^{-3} cm, W = 10^{-2} cm and L = 10^{-1} cm. The electrical parameter measured are: In = 1.2 mA & $B_2 = 5 \times 10^{-2}$ Tesla. Determine **[4]**

1) The Hall voltage and

2) The Hall field

ii) Explain Eber-moll model of BJT. How it is used to define equations for I_E and I_C. Draw basic Eber-moll equivalent Circuit. **[3]**

b) Obtain expression for thermal equilibrium electron Concentration in the Conduction band. Calculate the thermal equilibrium Concentration at an electron in silicon at T = 300 K. Assume the Fermi-energy is 0.27 ev below the Conduction band. The value of Nc for silicon at T = 300 K is 2.8×10^{19} cm^{-3}. (Given K = 8.65×10^{-5} ev). **[5]**

Q5) Attempt the following questions:

a) Classify the solids based on periodic structure, what is their feature? Describe general characteristics of solid state. Distinguish between amorphous and Crystalline solids. **[7]**

b) What are methods for semiconductor crystal growth? Explain the epitaxial growth method to develop a pure crystal in brief. **[5]**

Q6) Attempt the following questions:

a) What is mean by ambipolar transport? Derive the equation for ambipolar transport. What are the merits of it? **[7]**

b) Define space charge region in p-n junction. A silicon PN junction at T = 300 K within ni = 1.5×10^{10} cm^{-3}. Assume that the n-type doping is 1×10^{16} cm^{-3} and forward bias of 0.70 volt is applied to the PN junction. Calculate the minority carrier hole concentration at the edge of space charge region. **[5]**

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

a) Explain with diagram working of Heterojunction Bipolar Transistor (HBT) What are special feature of HBT over BJT? List the applications of HBT.

b) Describe concept of excess carrier generation and recombination rate across a semiconductor.

c) With the help of neat diagram explain the working principle of polysilicon Emitter BJT. Comment on the increase in common emitter current gain using this transistor.

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Total No. of Questions : 5]

SEAT No. :

PD3552

[Total No. of Pages : 4

[6484]-24

M.Sc. - I

ELECTRONIC SCIENCE

ELDT - 124 : Fiber Optic Communication Systems

(2019 Pattern) (Semester - II) (Credit System) (Elective Theory Course-2)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Question 2 to 5.***
3) ***Figures to the right indicate full marks.***
4) ***Use calculator or log table wherever necessary.***

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

a) What is beam splitter?

b) What are different types of semiconductor optical amplifiers?

c) How power transfer takes place in optical fiber couplers?

d) What is main function of time coding?

e) Draw ring and start topologies for communication system.

f) What are effects of dispersion?

Q2) a) Attempt any two of the following. **[6]**

i) Explain backscatter measurement method for OTDR.

ii) Explain the concept of WDM.

iii) Describe link power budget analysis.

b) What are major choices for selecting major components for optical fiber communication system. **[4]**

P.T.O.

Q3) a) Attempt any two of the following. **[6]**

i) What are advantages of multiplexing? What are their types?

ii) The sampling rate for each speech channel on 30 channel PCM system is 8 KHz and each sample is encoded into 8 bits. Determine bit rate for the system and duration of time slot.

iii) Draw schematic diagram of semiconductor optical amplifiers and explain it.

b) A 2 km length of multimode fiber is attached to apparatus for spectral loss measurement. The measured output voltage from photodetector using the full 2 km fiber length is 2.1V at wavelength of 0.85μm. When fiber is then cut back to leave a 2m length, the output voltage increases to 10.7V. Determine the attenuation per KM for the fiber at a wavelength of 0.85 μm & estimate the accuracy of result. **[4]**

Q4) a) Attempt any two of the following. **[6]**

i) What is working principle of Raman amplifier?

ii) Explain fiber bragg grating.

iii) Explain overall fiber dispersion in multimode fibers.

b) A multimode step index fiber has a numerial aperture of 0.3 & core R-I = 1.45. The material dispersion parameter for the fiber is 250 PS $nm^{-1}km^{-1}$ which makes material dispersion the totally dominating chromatic dispersion mechanism. Estimate total rms pulse broadening per km when fiber is used with LED source of rms spectral width 50nm. **[4]**

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

a) Explain an electrooptic y junction switch.

b) Explain in brief any one type of coupler.

c) List any four applications of LASER for optical communication.

d) Write a short note on rise time budget analysis.

e) Draw and label experimental arrangement for multimode fiber dispersion measurement in time domain.

f) Draw and label experimental set up for measurement of fiber scattering loss.

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Total No. of Questions : 5]

PD3552

[6484]-24

M.Sc. - I

ELECTRONIC SCIENCE

ELDT - 124 : Fundamentals and Applications of AVR Microcontroller

(2019 Pattern) (Semester - II) (Elective - 2)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Attempt any three questions from Question 2 to 5.***
3) ***Figures to the right indicate full marks.***
4) ***Use calculator or log table wherever necessary.***

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

a) Write an essembly language program to add two numbers 0×33 and 0×66.

b) For an 8-bit ADC, we have V_{ref} = 2.56V. Calculate the D_0 to D_7 output, If the analog input is 2.1V.

c) Write any two advantages of 1N instruction over LDS instruction.

d) What voltage levels are used for binary 0 and binary 1 in RS232.

e) Write a program to get data from PINB and send it to the I/O port register PORTC continuously.

f) Find the UBRR value needed to have band rate 9600 (Assume that, F_{osc} = 8.0 MH_z)

Q2) Answer the following.

a) Write features of RISC Architecture implemented by AVR microcontroller. **[6]**

b) Explain how to select different oscillator clock sources for ATmega 16. **[4]**

Q3) Answer the following.

a) Draw a circuit diagram for interfacing of DACO808 with AVR, Also, write a C program to generate stair - step ramp. **[6]**

b) Write assembly language program to create a square wave of 50% duty cycle on bit 0 of port C for ATmega 16 microcontroller. **[4]**

Q4) Answer the following.

a) List the features of ADC module in ATmega16. Also, write a C program to read data from channel 0 of ADC and display the result on port B and port D continuously. **[6]**

b) Write the steps to transfer of data serially using USART. **[4]**

Q5) Solve any four of the following.

a) Explain flags of status register (SREG). **[2.5]**

b) Write any five data types of AVR C with their size and range. **[2.5]**

c) Write a short note on any four addressing modes. **[2.5]**

d) Write a short note on two - digit multiplexed seven segment display. **[2.5]**

e) Explain AND gate OR gate operation instruction with an example of each. **[2.5]**

f) Explain the working of 4×4 matrix keyboard. **[2.5]**

Total No. of Questions : 7]

SEAT No. :

PD3553

[Total No. of Pages : 2

[6484]-31
M.Sc. - II
ELECTRONIC SCIENCE
ELT - 231 : Advanced Communication Systems
(2019 Pattern) (Semester - III)

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) Write the significance of modulation Index.

b) What is noise?

c) Calculate frequency deviation of FM signal with modulation index 0.5 and modulating frequency of 6kHz.

d) List the advantages of smart antenna.

e) Explain the term ionospheric scatter in case of propagation of wave.

f) Draw the GSM system architecture.

Q2) Attempt the following.

a) Explain QAM with neat diagram. **[7]**

b) Draw the block diagram of FM transmitter & explain its working. **[5]**

Q3) Attempt the following.

a) Describe sky wave propagation with the help of neat labelled diagram. **[7]**

b) What is microwave? Write their application in communication with frequency range. **[5]**

P.T.O.

Q4) Attempt the following.

a) With the help of block diagram, explain satellite transponder. **[7]**

b) An AM broadcast station operates at its maximum alloweded total output of 50kw & 95% modulation. Calculate the total power transmitted in sidebands. **[5]**

Q5) Attempt the following.

a) Describe XMODM protocol and write the importance of it. **[7]**

b) Explain geostationary satellite. Write its advantages. Write apogee and perigee in case of satellite. **[5]**

Q6) Attempt the following.

a) With the help of neat diagram explain working of delta modulation. Write advantages and disadvantages of it. **[7]**

b) Explain TDMA and write its applications. **[5]**

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

a) FSK

b) Cellular mobile communication

c) EBCDIC

Total No. of Questions : 7]

SEAT No. : ____

PD3554

[Total No. of Pages : 2

[6484]-32
M.Sc. - II
ELECTRONIC SCIENCE
ELT-232: Mechatronics and Robotics (MAR)
(2019 Pattern) (Semester - III) (Credit - 4) (Theory)

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) ***Figures to the right indicate full marks.***
4) ***Color pencils/pens other than red color are allowed to use.***
5) ***Draw neat diagram wherever necessary.***
6) ***Use of calculator is allowed.***

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

a) Define Mechatronics.

b) Define AC motors.

c) What is Purpose of Robotics?

d) What is Bearings?

e) Why feedback is important?

f) What is rigid motions?

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

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

ii) Draw the construction of BJT and explain BJT as a solid state switch with circuit diagram. **[4]**

b) List and explain any five applications of Robot. **[5]**

Q3) Attempt the following. **[12]**

a) i) What is need of trajectory planning. **[3]**

ii) Explain **[4]**

1) Angular velocity

2) Angular acceleration

b) Explain AC motor construction and working with neat diagram. **[5]**

P.T.O.

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

a) i) Define **[3]**

1) Sensors

2) Actuators

3) Transducers

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

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

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

a) i) Explain toggle and slider crank in brief. **[3]**

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

b) What is Mutual Inductance? Explain construction and working or relay. **[5]**

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

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

ii) What is gears? Explain gear trains and gear ratio in brief. **[4]**

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

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

a) Mechatronics in space applications.

b) Robot power with Artificial Intelligence (AI).

c) Mechanical building blocks.

d) Euler - Lagrange equation by forming Lagrangian of a system.

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Total No. of Questions : 7]

SEAT No. :

PD3555

[Total No. of Pages : 2

[6484]-33
M.Sc. - II
ELECTRONIC SCIENCE
ELT-233: Control Systems
(CBCS) (2019 Pattern) (Semester - III) (Credit - 4)

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

Instructions to the candidates:

1) ***Q.1 is compulsory.***
2) ***Solve any five questions from Q.2 to Q.7.***
3) ***Q.2 to Q.7 carry equal marks.***
4) ***Neat diagrams must be drawn wherever necessary.***
5) ***Use of Non-programable calculator is allowed.***

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

a) What is control system?

b) Define transfer function.

c) What is annunciator?

d) What is fuzzy logic controller?

e) Determine transfer function of Low pass filter (RC).

f) What is derivative overrun?

Q2) Attempt the following:

a) Explain the concept of feedback control. Describe various elements used in control system. **[7]**

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

Q3) Attempt the following:

a) Using Routh-Hurwitz criterion determine stability of the system having denominator polynomial D(s) = D(s) = $s^3 + 4s^2 + s + 16 = 0$. **[7]**

b) Explain the construction and working of a solenoid. **[5]**

Q4) Attempt the following:

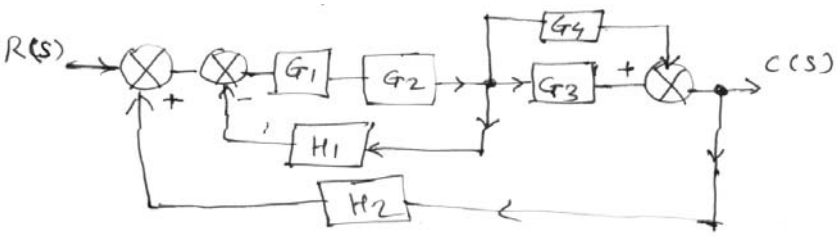
a) Explain the concept of gain margin and phase margin. Explain how these values help in studying stability of Bode plot. **[7]**

b) Explain the construction and working of the synchro. **[5]**

P.T.O.

Q5) Attempt the following:

a) Reduce the given block diagram to it's canonical form (simple) and hence obtain the equivalent transfer function $\frac{C(s)}{R(s)}$. **[7]**



b) Explain the working of control valve. **[5]**

Q6) Attempt the following:

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

b) A controller outputs a 4 to 20 mA signal to control motor speed from 140 to 600 rpm with a linear dependence calculate current corresponding to 310 rpm. **[5]**

Q7) Write short notes on any <u>two</u> of the following.

a) Distributed control system. **[6]**

b) Adaptive control system. **[6]**

c) What is integral wind up? **[6]**

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Total No. of Questions : 5]

SEAT No. :

PD3556

[Total No. of Pages : 4

[6484]-34
M.Sc. - II
ELECTRONIC SCIENCE
ELT-234 : Wireless Communication System - I
(2019 Pattern) (Semester - III) (Elective Theory) (Creedit - 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.***
4) ***Neat diagram must be drawn wherever necessary.***

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

a) What is the full form of CDMA and WCDMA?

b) What is an OFDM system?

c) List applications of smart antennas in wireless systems.

d) List wireless communication technologies used for short range communication.

e) What is spectrum sharing?

f) What is handover in mobile communication?

Q2) Answer the following.

a) i) Explain the network and switching sub-system of GSM architecture. **[3]**

ii) What is wireless local loop (WLL)? Explain architecture of typical WLL system. **[3]**

b) Explain the working principle of MIMO system. **[4]**

Q3) Answer the following.

a) i) What is a communication relay? Give types of communication relays. **[3]**

ii) Explain working principle of RFID technology. **[3]**

b) Explain the concept of spread spectrum. **[4]**

P.T.O.

Q4) Answer the following.

a) What is the role of localization in mobile communication systems? Explain different methods of localization used in cellular network. **[6]**

b) Explain the key features and technological advancement of 3G wireless network compared to 2G network. **[4]**

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

a) CDMA 2000 cellular technology.

b) GPRS system architecture

c) Paging system

d) GPS

e) Bluetooth

f) Soft handoff

Total No. of Questions : 5]

PD3556

[6484]-34
M.Sc. - II
ELECTRONIC SCIENCE
ELT 234 : Fundamentals of Internet of Things
(2019 Pattern) (Semester - III) (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) ***Questions 2 to 5 carry equal marks.***
4) ***Color pencil use (other than red color) is not restricted.***

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

a) ITU is abbreviation for what?

b) Give the principle of RFID.

c) What is IoT framework?

d) Define web of things.

e) Define IoT.

f) Give a two types of sensors used for smart city.

Q2) Attempt the following.

a) i) What is long form and role of MQTT? **[2]**

ii) Explain any four advantages of IoT. **[4]**

b) Explain QOS. **[4]**

Q3) Attempt the following.

a) i) List and explain role of layers in four - layer IoT Architecture. **[4]**

ii) Explain connecting nodes. **[2]**

b) Why IP is needed? Explain. **[4]**

Q4) Attempt the following.

a) i) What is IoT interoperability? **[2]**

ii) Explain any four IoT security challenges? **[4]**

b) Explain various integration approaches of WSN. **[4]**

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

a) Data link layer protocol

b) IoT architecture

c) Sensor Technology

d) Satellite Technology for communication

e) Traffic characteristics

f) Environment characteristics of IoT

Total No. of Questions : 5]

SEAT No. : ____

PD3557

[Total No. of Pages : 2

[6484]-41

M.Sc. -II

ELECTRONIC SCIENCE

ELT 241: PLC Programming and Applications

(2019 Pattern) (CBCS) (Semester-IV)(Credit-2)

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

Instructions to the candidates:

1) ***Question 1 is compulsory.***
2) ***Solve any three questions from Q.2 to Q.5.***

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

a) What is PLC?

b) What are the types of PLC programming languages?

c) State the advantages of automation using PLC?

d) List different brands of PLC?

e) What are the advantages of PLC over Relays?

f) What do you mean by Rung in PLC?

Q2) a) i) What is the function of a PLC input interface module? **[2]**

ii) Explain SCAN cycle of PLC in details. **[4]**

b) Draw a block diagram of PLC and explain in brief. **[4]**

Q3) a) i) Explain the latch instruction of PLC. **[2]**

ii) Explain timer instructions -TON, TOFF, RTO. **[4]**

b) Explain output module in PLC. **[4]**

Q4) a) i) What is difference between NO and NC contacts? **[2]**

ii) Explain counter instructions-CTU, CTD. **[4]**

b) Explain the function of ADC and DAC in PLC. **[4]**

P.T.O.

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

a) Write a note on watchdog timer.

b) Arithmetic instructions of PLC.

c) Draw ladder diagram for AND and OR gate.

d) Master control Reset (MCR) in PLC.

e) Human machine interface in PLC.

f) Data transfer instructions of PLC.

Total No. of Questions : 7]

SEAT No. :

PD3558

[Total No. of Pages : 2

[6484]-42
M.Sc. (Part-II)
ELECTRONIC SCIENCE
ELDT 243 : Technical Communication
(2019 Pattern) (Semester -IV)

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

Instructions to the candidates:

1) ***Question 1 is Compulsory.***
2) ***Attempt any five questions from Q.2 to Q.7.***
3) ***Questions 2 to 7 carry equal marks.***

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

a) 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) What is mean by seminar?

f) What is the purpose of technical written communication?

Q2) Attempt the following.

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

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

Q3) Attempt the following.

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

b) Draw and explain process of communication. **[5]**

Q4) Attempt the following.

a) What is Interview? Write its purpose and sequence of Interviewers. Explain in brief any two types. **[7]**

b) Give the reasons of Conducting a group discussion. **[5]**

P.T.O.

Q5) Attempt the following.

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

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

Q6) Attempt the following.

a) What is barrier? Explain different types of barrier in brief. **[7]**

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

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

a) Structuring of report

b) Sentences & paragraph

c) Conference & workshop