Total No. of Questions : 5] **[Total No. of Pages : 2**

P1207

[3829] - 21

M.Sc.

ELECTRONIC SCIENCE

EL2 UT03 : Applied Electromagnetics, RF, Microwave

(Sem. - II)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Use of non-programmable calculator is allowed.***
3) ***Draw a necessary diagram wherever necessary.***

Q1) Solve any two. **[8 marks each]**

a) State the importance of electrostatic in daily life. Explain any one application of electrostatics in detail.

b) What are wave guides? Use Maxwell's equations to obtain field equations for TE mode propagating in a rectangular waveguide.

c) Obtain the scattering matrix of a directional coupler.

Q2) Solve any two. **[8 marks each]**

a) Describe the physical structure and principle of operation of a JFET.

b) Explain the concept of antenna temperature and its applications in passive remote sensing and signal to noise ratio.

c) What are the different devices used for obtaining a uniform magnetic field? Explain in detail.

Q3) Solve any four. **[4 marks each]**

a) Explain the term skin depth and its significance associated with it.

b) Write a short note on single stub matching.

c) Write a short note on RF sputter deposition.

P.T.O.

d) Explain the role of reflector in various types of antennas.

e) Write a short note on heart dipole field.

Q4) Solve any four. **[4 marks each]**

a) Determine the impedance of a ground at 200 MHz, Given quantities of ground are $\varepsilon r = 14$, $\mu r = 1$ and $\sigma = 10^{-2}$ ℧ m^{-1}

b) Explain EM wave propagation through an optical wave guide.

c) Compare the performance of GaAs MOSFET with silicon MOSFET.

d) An antenna has radiation resistance 72 Ω and loss resistance 8 Ω and power gain of 12 dB. Determine antenna efficiency and its directivity.

e) Draw an equivalent circuit of oxon transmission line. How it is noiseless and lossless?

Q5) Solve any four. **[4 marks each]**

a) State Maxwell's equations in both differential and integral form. Explain the significance of each.

b) A transmission line has a characteristics impedance of 50 + j 0.01 Ω and is terminated in a load impedance of 73 - j 42.5 Ω. Calculate

i) Reflection coefficient ii) Standing wave ratio

c) Explain the behaviour of a tunnel diode as a

i) Bistable and ii) Astable multivibrator.

d) Define any four antenna parameters.

e) Explain electromagnetic effects in high speed digital circuits in short.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P1208

[3829] - 22

M.Sc.

ELECTRONIC SCIENCE

EL2 UT04 : Design and Implementation of Digital Circuits

(Sem. - II)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Attempt any two. **[16]**

a) Design a BCD counter with the help of logic gates, shift registers and 4 bit adder.

b) Design an automatic car alarm circuit, which detects the seat belt, head lights, the ignition and door,

Consider the conditions to switch on alarm

i) If ignition is off and head lights are on

ii) The door is open and ignition is on

iii) The seat belts are not fastened when ignition is on.

c) With the help of look ahead carry generator design 4 bit parallel adder.

Q2) Attempt any two. **[16]**

a) Design a counter to generate 0,2,4,5,0.....Give all steps and draw final hardware diagram.

b) Design 3 contestants game circuit using sequential circuit to indicate button press by any player first.

c) What is latch? Compare with DFF. Convert D to T FF. Draw timing diagrams with suitable inputs for latch and DFF.

P.T.O.

Q3) Attempt any two. **[14]**

a) Draw logic diagram of Arithmatic logic unit and explain function table for 2 bit data.

b) Explain the bus organized processor with the help of block diagram.

c) What is scratch pad memory? Draw diagram of processor using scratch pad memory and explain it.

Q4) Attempt any Two. **[16]**

a) Explain configurable block in FPGA with the help of logic block diagram.

b) Explain working of DRAM cell with the neat diagram. Discuss read and write operation.

c) Draw architecture of CPLD. Give basic structure of functional block used in CPLD.

Q5) Attempt any three **[18]**

a) Write VHDL code for 4 to 1 multiplexer using logic equations.

b) Write VHDL code using structural modelling for 3 bit asynchronous up/down counter.

c) Write VHDL code for 3 to 8 decoder using structural style of modelling.

d) Write VHDL code to convert 4 bit binary number to Gray code use call of the form bin 2 gray (bin-num) in your VHDL module.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P697

[3829] - 101

M.Sc.

ELECTRONIC SCIENCE

EL1 UT 01 : Foundation of Semiconductor Devices

(Sem.- I) (New 2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Draw neat diagrams wherever necessary.***
3) ***Use of non-programmable calculator is allowed.***

Q1) Attempt any two of the following. **[2 x 8 = 16]**

a) Why pure crystal is needed as a substrate? List various methods in growth of semiconductor material. Explain any one in detail.

b) Describe qualitatively, charge flow in a p-n junction with zero bias, reverse bias and forward bias conditions. Draw the necessary energy band diagrams.

c) What is Hall effect? With the help of geometry for measuring the Hall effect obtain relation for Hall voltage, hole mobility and electron mobility.

Q2) Attempt any two of the following: **[2 x 8 = 16]**

a) Explain in detail transistor switching characteristics. Discuss charge storage in the base and collector at saturation and in active mode.

b) Differentiate between JFET and MOSFET. Draw the small signal equivalent circuit for JFET and discuss ac response from it.

c) What is the concept of MESFET? Explain with cross section diagram of idealized MESFET its working and its various types.

Q3) Attempt any four of the following: **[4 x 4 = 16]**

a) What are Miller indices? What is the significance of labelling a crystal using reciprocal lattice?

b) Explain variation of E_F with doping concentration and temperature.

c) Discuss idealized doping profiles for step junction and linearly graded junction.

d) Describe the time delay factors in the frequency limitations of BJT.

e) Draw a diagram for MOSFET as two port network. Explain low frequency and high frequency response from this diagram.

Q4) Attempt any four of the following: **[4 x 4 = 16]**

a) Discuss imperfection and impurities in solids.

b) An electron has a kinetic energy of 20 MeV. Determine de-Broglie wavelength.

c) Assume the Fermi energy level is 0.30 eV below the conduction band energy. Determine the probability of a state being occupied by an electron at Ec.

d) Discuss use of Ebers-moll equations in computer aided circuit analysis program such as SPICE.

e) Explain the effect of narrow channel on the working of MOSFET.

Q5) Attempt any FOUR of the following: **[4 x 4 = 16]**

a) From thermal equilibrium energy band diagram for n-type and p-type semiconductor, explain the concept of Quasi-Fermi energy levels.

b) Write an equation to estimate energy levels of an electron in an infinite potential well. Calculate first three energy levels of an electron in an infinite potential well of width 5Å.

(Given: $\hbar = 1.054 \times 10^{-34}$, $m = 9.11 \times 10^{-31}$kg)

c) Describe operation of a laser diode.

d) Explain working of DIAC, TRIAC. State its applications.

e) Write short note on modern FET structure with respect to select structure survey.

Total No. of Questions : 5] **[Total No. of Pages : 3**

P698

[3829] - 102

M.Sc.

ELECTRONIC SCIENCE

EL1 UT 02 : Analog Circuit Design and Analysis

(Sem.- I) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Use of log-table / non-programmable calculator is allowed.***

Q1) Solve any two.

a) Draw block diagram of Op-amp. Explain the purpose of each block in brief. **[8]**

b) Elaborate the following terms used in network analysis with suitable examples; **[8]**

i) Transfer function ii) Poles and Zeros

iii) Complex plane and iv) Dominant pole.

c) Obtain the inverse laplace transformation for the given functions. **[8]**

i) $F(s)=\frac{s}{(s+1)(s+3)}$ and ii) $F(s)=\frac{1}{s(s+1)}$

Q2) Solve any two.

a) With the help of half circuit concept, analyse the emitter coupled pair and deduce the expression for differential mode gain, common mode gain and C.M.R.R. **[8]**

b) What do you mean by ideal current source? With proper circuit diagram, explain the working of current mirror circuit and widlar current source. State the advantage of widlar current source. **[8]**

P.T.O.

c) i) The slew rate of IC-741 is 0.5 V/μ sec. Calculate the maximum frequency for which the op-amp will produce undistorted sine-wave output of the values 12 Vpp and 9Vpp. **[4]**

ii) Explain the concept of Active load and describe its use in internal stages of op-amp. **[4]**

Q3) Attempt any two:

a) i) Derive an expression for Z-parameters in terms of Y-parameters. **[4]**

ii) Find the step response of a series R-L-C circuit by using Laplace transformation. **[4]**

b) i) What is peak detector? Explain the working of peak detector circuit using op-amp. State its limitations. **[4]**

ii) Explain the technique of temperature compensation using two transistors (matched pair) in a log-amplifier. **[4]**

c) With proper circuit diagram, using three op-amps, explain the working of instrumentation Amplifier.

Deduce an expression for its output voltage. What is the role of gain resistor? **[8]**

Q4) Attempt any two.

a) i) Explain shielding and guarding techniques used in construction of op-amp circuits. **[4]**

ii) Explain the causes of errors in integrator circuit using op-amp and suggests the remedies to avoide these errors. **[4]**

b) i) Explain the need and applications of low-power design. **[4]**

ii) What are the different filter approximation techniques? Explain any two in detail with limitations and advantages. **[4]**

c) i) Write a short note on weighted resistor arrangement for DAC. State its limitations. **[4]**

ii) Explain with circuit diagram, how to boost the out put current capability of an op-amp? **[4]**

Q5) Attempt any two:

a) i) Explain the working of S/H circuit using FET and op-amp. Comment on the choice of capacitor value. **[4]**

ii) Find the Laplace transformation of - e^{at} and Sin(at). **[4]**

b) i) Explain the working of Flash-ADC. **[4]**

ii) Explain in brief pipelined converter and integrating converter. **[4]**

c) i) For a 12-bit ADC, with 1MHz clock, calculate-Maximum conversion time, Average conversion time and maximum conversion rate. **[4]**

ii) Write a short note on "Segmented DAC". **[4]**

Total No. of Questions : 5] **[Total No. of Pages : 4**

P699

[3829]-103
M.Sc.
ELECTRONIC SCIENCE
EL1 UT 03 : Instrumentation and Measurement Techniques
(Sem. - I)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carries equal marks.***
3) ***Draw neat labeled diagrams wherever necessary.***
4) ***Use of logarithmic table and non-programmable calculator is allowed.***

Q1) Answer any four of the following : **[4 × 4 = 16]**

a) Comment on the following statements.

i) 'Conformity is necessary, but not sufficient condition for precision because of lack of significant figures obtained'.

ii) 'Precision is necessary, but not sufficient condition for accuracy'.

b) Define the following terms in the context of normal frequency distribution of data.

i) Mean value.
ii) Deviation.
iii) Average deviation.
iv) Standard deviation.

Give example of each.

c) List the dynamic characteristics of measurement system. First order instrument is to measure signals with frequency content upto 100Hz with an amplitude accuracy of 5%. What is the maximum time constant? And phase shift at 50Hz.

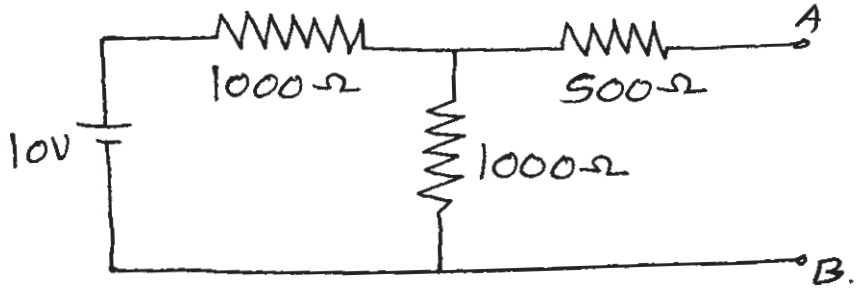
d) State different sources of noise. Explain the terms noise factor and noise figure. A measurement system uses a resistance straingauge for the measurement of pressure. The gauge has unstrain resistance of 120Ω is connected in one arm of a wheatstone bridge. The other three arms have resistance of 120Ω each. The temperature is 300°K and bandwidth is 100kHz. The bridge output is voltage signal.

P.T.O.

Find signal to noise ratio generated by the resistors

i) When a pressure of 7000kN/m^2 is applied.
ii) When applied pressure is 7kN/m^2. Comment of the result.
(Boltzman's Constant = 1.38×10^{-23} J/^{o}K)

e) It is desired to measure the value of current through 500Ω resistor as shown in below figure.



By connecting 100Ω ammeter.

Find :

i) The actual value of current.
ii) The measured value of current and
iii) The percentage error in measurement and accuracy.

Q2) Answer <u>any four</u> of the following : **[4 × 4 = 16]**

a) List the transducers used for displacement measurement. The output of potentiometer is to be read by a recorder of 10kΩ input resistance. The non-linearity must be held to 1%. A family of potentiometers having thermal rating of 5 W and resistance range from 100Ω to 10 kΩ in the step of 100Ω are available. Choose a potentiometer that has the greater possible sensitivity and which meets the non-linearity requirement. Find the maximum excitation voltage permissible with the potentiometer. What is the sensitivity if the potentiometer is a single turn (360^o).

b) Describe the factors influencing the choice of transducer for measurement of particular parameter.

c) List the types of strain gauges. State applications of strain gauge. A compressive force is applied to a structural member. The strain is 5 micro-strain. Two separate strain gauges are attached to the structural member, one is a Nickel wire strain gauge having a gauge factor of – 12.1 and the other is Nichrome wire strain gauge having a gauge factor of 2. Calculate the value of resistance of the gauges after they are strained. The unstrain resistance of the gauges is 120Ω.

d) Give classification of temperature transducers. A platinum resistance thermometer has a resistance of 100Ω at 25°C. Find its resistance at 65°C. The platinum has a resistance temperature coefficient of 0.00392/°C. If the resistance in 150Ω, calculate the temperature.

e) Give the working principle and application of the following (any four) :

i) Ultrasonic transducer.
ii) Thermal conductivity gauge.
iii) Electromagnetic flow meter.
iv) Capacitor microphone.
v) Hot wire anemometer and
vi) Optical pyrometer.

Q3) Answer <u>any four</u> of the following : **[4 × 4 = 16]**

a) A steel cantilever is 0.25m long, 20mm wide and 4mm thick.

i) Calculate the value of deflection at the free end of it when a force of 25N is applied at this end. The modulus of elasticity for steel is 200GN/m^2.

ii) An LVDT with sensitivity of 0.5V/mm is used. The voltage read is 10V voltmeter having 100 divisions two tenth of division can be read with certainty. Calculate minimum and maximum value of force that can be measured with this arrangement.

b) What is LVDT? Describe LVDT with neat diagram and state different applications of LVDT.

c) Draw the equivalent circuit of piezoelectric transducer. "For medium and high frequency, the magnitude of the voltage across the loads is independent of frequency". Comment on the statement.

d) Describe the use of variable reluctance/FM oscillator digital system used for force measurement.

e) Describe the construction and working of thermocouples. Discuss the compensation techniques used with temperature measurement using thermocouples.

Q4) Answer <u>any four</u> of the following : **[4 × 4 = 16]**

a) Derive the expression for bridge sensitivity in the case of voltage sensitive wheatstone bridge having equal arms.

b) Describe frequency selective wave analyzer with the help of block diagram. Define the terms, frequency distortion, phase distortion and Amplitude distortion.

c) With block diagram explain the working of DC signal conditioning system.

d) State the importance of telemetry used in instrumentation system. Describe the different methods of data transmission.

e) Describe different telemetry channels used. Explain voltage telemetry with proper diagram.

Q5) Answer <u>any four</u> of the following : **[4 × 4 = 16]**

a) List the types of recorders. Describe the magnetic tape recording technique.

b) Describe the strip chart recorder with neat circuit block diagram. State application of strip chart recorder.

c) List the points to be considered in selection of recorder for particular applications. State the requirements of recording data.

d) With block diagram describe FM telemetry system. Compare FM and AM.

e) A T type thermocouple was found to have linear calibration between $0^{o}C$ to $400^{o}C$ with emf at maximum temperature equal to 20.68mV, the ref. junction at $0^{o}C$. Determine.

i) A correction tobe made to the indicated emf if reference junction is at $25^{o}C$.

ii) If the indicated emf is 8.92mV, determine the temperature of hot junction with reference to $0^{o}C$.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P700

[3829] - 201

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT 04 : Applied Electromagnetics, RF and Microwave

(Sem.- II) (2008 Pattern) (New)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Log-book / calculator is allowed.***

Q1) Attempt any two of the following. **[2 x 8 = 16]**

a) Explain the construction, distributed parameters, characteristic impedence and attenuation losses for the parallel strip lines.

b) State the salient features of Hornantenna. Why it is called a super gain antenna? Explain its construction and working in brief.

c) With the help of energy band diagram, explain the operating principle of Tunnel diode and its characteristics.

Q2) Attempt any two of the following. **[2 x 8 = 16]**

a) Discuss electromagnetic effects in high speed digital systems with suitable examples.

b) Explain MESFET and MOSFET with reference to physical structure, principle of operation and electronic applications in brief.

c) Starting with $\nabla.A=0$, derive the mathematical expression for the Lorentz gauge condition.

P.T.O

Q3) Attempt any four of the following: **[4 x 4 =16]**

a) State and prove Poynting Vector theorem.

b) Explain the terms lumped parameters and distributed parameters with reference to transmission line.

c) Estimate the power radiated by a 10 cm dipole antenna operated at 50MHz with an average current of 5mA.

d) Draw graphical sketch to show the electric field lines and magnetic field lines in a hollow cylindrical waveguide for TE11 mode and TE01 mode.

e) Explain the absorption of microwave by atmosphere.

Q4) Attempt any four of the following. **[4 x 4 = 16]**

a) In case of good conductor, show that the skin depth is represented by $\delta = \sqrt{\frac{2}{\mu\omega\sigma}}$

b) Write a short note on smith chart.

c) Write a short note on shielding of transmission lines.

d) Elaborate, how the antenna is used to measure a distant temperature.

e) Explain in brief RF heating.

Q5) Attempt any four of the following: **[4 x 4 = 16]**

a) Write a short note on Global positioning satellite.

b) Calculate intrinsic impedence of free space, considering the standard values of permitivity and permiability of free space.

c) Discuss the power losses in microstrip lines.

d) Explain the concept of retarded potential.

e) Explain the role of reflector in various types of antenna.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P701

[3829] - 202

M.Sc.

ELECTRONIC SCIENCE

EL2UT-05 : Communication Electronics

(Sem.- II) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***

Q1) Answer any FOUR of the following. **[4 x 4 = 16]**

a) Explain the utility of time and frequency domains in design and analysis of communication systems.

b) Write the advantages and disadvantages of FM over AM.

c) With the help of diagram. Explain synchronous stagger tunning.

d) Explain any two line codes in short.

e) Explain the working of QAM in short.

f) Explain dialing block of telephone system in short.

Q2) Attempt any TWO of the following. **[2 x 8 = 16]**

a) i) Explain the working of diode detector used for amplitude modulated signal.

ii) With the help of circuit diagram, explain the working of tuned RF amplifier.

b) Explain the following terms with reference to pulse code modulation (PCM)

i) Quantisation ii) Quantisation noise

iii) Companding iv) Encoding.

c) Explain the importance of bit oriented protocol over character oriented. Explain in short the basic format of SDLC and HDLC messages.

P.T.O

Q3) Write any FOUR of the following. **[4 x 4 =16]**

a) State sampling theorem. Write its importance in digital data communication.

b) An AM wave is represented by the expression v = 5 (1+0.6 cos 6280t) sin $211*10^4$ volt calculate minimum, maximum, amplitude of the AM wave and frequency components contained in the modulated wave.

c) With the help of circuit diagram, explain the working of any one method of neutralisation.

d) Explain the working of delta modulated transmitter system.

e) Describe a typical data communication link with special reference to DTE and DCE.

Q4) Attempt any TWO of the following. **[2 x 8 = 16]**

a) What is TDM? With the help of block diagram, explain the working of TDM in detail.

b) What is XMODEM protocol? Write the importance of it. Draw the frame structure of XMODEM and explain each field in short.

c) What is transponder? Explain any one type of transponder working in detail. Explain its use in satellite communication.

Q5) Write any FOUR of the following. **[4 x 4 = 16]**

a) Draw the block diagram of basic communication system and explain the function of each element in short.

b) Explain the working of diode type balance modulator used to supress the carrier.

c) With the help of diagram, explain multistage tuned amplifier.

d) What is digital subscriber line (DSL)? Explain any one type of it in short.

e) Draw and explain segregated ISDN architecture in short.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P702

[3829] - 203

M.Sc. I

ELECTRONIC SCIENCE

EL2UT06 : Digital System Design using VHDL

(Sem.- II) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Attempt any TWO of the following. **[2 x 8 = 16]**

a) What is function in VHDL? How it is different from procedure? Write a function to add two 4-bit vectors and a carry and returns 5-bit sum.

b) List different sequential statements used in VHDL. Explain any two in detail. Write a VHDL code for 4-bit up, down counter.

c) Explain in detail different steps of digital system design using VHDL.

Q2) a) Attempt any TWO of the following. **[2 x 8 = 16]**

i) Design a BCD to seven segment code converter using NAND gates only Assume common cathode seven segment display in your design.

ii) Implement the following boolean function with 8 to 1 multiplexer. $f(A,B,C,D) = \Sigma m(0,2,6,10,11,12,13) + d(3,8,14)$.

iii) Consider the digital thermostat in which measured room temperature is converted to a 8-bit digital number and applied to the A inputs of a comparator.

The desired room temperature, entered from a keypad is stored in a register that is connected to B input. If A<B, the furnace should be activated to heat the room, the furnace should continued to heat while A=B and shut off when A>B. As room Cools off the furnace should stay off while A=B and turn on again when A<B. Design the circuit using 4-bit magnitude comparator.

P.T.O

b) Attempt any ONE of the following. **[1 x 4 = 4]**

i) Design a circuit for even parity generator and cheeker for 3-bit message.

ii) Write VHDL code for octal to binary encoder.

Q3) Attempt any Two of the following. **[2 x 8 =16]**

a) Design a sequence generator using D flip-flop to generate the sequence 0-2-3-6-7 and repeat.

b) Explain procedure for design of sequential circuit. Draw state diagram for 3-bit counter. Design 3-bit binary counter using T flip-flop.

c) A vending machine deliver package of gum after Rs 3 deposited, there is single coin slot for Rs1 and Rs2 Design a finite state machine to model this vending machine.

Q4) Attempt any Two of the following. **[2 x 6 = 12]**

a) Explain with block diagram processor unit with scratch pad memory. Give the sequence of micro operation to perform the operation R3=R1+R2.

b) Give complete account of GAL 16 V 8 with reference to dedicated input pins, special function inputs and outputs What is OLMC in GAL 16 V 8? List different modes of GAL 16 V 8.

c) Explain with block diagram PLA.

Implement the following functions using PLA.

$A(X, Y, Z) = \Sigma m(1, 2, 4, 6)$

$B(X, Y, Z) = \Sigma m(0, 1, 6, 7)$

$C(X, Y, Z) = \Sigma m(2, 6,)$

Q5) Attempt any Two of the following. **[2 x 8 = 16]**

a) What is DRAM? Show with neat diagram cell arrangement in 16kx1 DRAM.What is function of $\overline{RAS}$ and $\overline{CAS}$ in DRAM? What do you mean by dynamic refreshing?

b) Draw FPGA architecture. Explain configurable logic block of FPGA.

c) Explain different types of ROM. Explain how data is stored and erased in EEPROM.

Total No. of Questions : 5] **[Total No. of Pages : 2**

P703

[3829] - 301

M.Sc. - II

ELECTRONIC SCIENCE

EL3 UT05 : Embedded Systems

(Sem. - III) (2008 Pattern) (New Course)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagram wherever necessary.***

Q1) Attempt any Four of the following. **[4 x 4 = 16]**

a) What is an embedded system? List any four features of embedded systems.

b) Explain interfacing of ADC with 8051 microcontroller.

c) Describe the terms : Assembler and cross-compiler.

d) Explain ADC module and associated registers in PIC microcontroller.

e) Explain different PORT registers of AVR microcontroller.

Q2) Write any Four of the following. **[4 x 4 = 16]**

a) Explain the organization of internal data and program memory of 8051 microcontroller.

b) Draw the block diagram to interface 8 KB data RAM with 8051 microcontroller. Write memory map of system.

c) What is debugger? Write its advantages in software development of embedded system.

d) Describe any four features of AVR microcontroller.

e) Write a 'C' program to monitor P1.4 continuously, when it becomes low, send 55H to P0 otherwise send AAH to port P0. (8051 microcontroller)

P.T.O.

Q3) Attempt any Two of the following. **[2 x 8 =16]**

a) Draw a functional block diagram of 8051 microcontroller and explain it in short.

b) Describe RS 232C communication standard. Write the features of it. Draw the connections between RS 232C and 8051 microcontroller.

c) Explain in detail the development steps of embedded systems design.

Q4) Write any Four of the following. **[4 x 4 = 16]**

a) Explain with neat diagram timer/counter control logic of 8051 microcontroller.

b) Write a short note on I2C protocol.

c) Write an assembly 1 'C' program for PIC microcontroller to flash LEDs connected to PORTB.

d) Write an assembly 1 'C' program for AVR to generate square wave using DAC.

e) Write an assembly 1 'C' program to rotate a stepper motor anticlockwise continuously. (8051 μc).

Q5) Attempt any Two of the following. **[2 x 8 = 16]**

a) Draw and explain architecture of PIC microcontroller.

b) With the help of diagram, explain memory organization of AVR microcontroller.

c) Write a 'C' program for 8051 microcontroller to display " Electronic Science" on first line of LCD.

ii) An integral controller is used for level control with a set point of 12 meter within a range of 10 to 15 meter. Controller output is 22% at set point. The constant K_I is 0.15% per second per percent error. If the level jumps to 13.5 meter calculate the controller output after 2 seconds.

Q3) Solve <u>any two</u> : **[2 × 8 = 16]**

a) i) Define the term stability of control systems. What is the difference between absolute stability and relative stability?

ii) Find range of values of K so that the system with following characteristic equation will be stable.

$F(s) = S(s^2 + s + 1)(s + 4) + K = 0$

b) Explain Zeigler-Nichols method for process loop tuning.

c) With a general block diagram explain the working of a PLC. Comment on selection and placement of I/O modules.

Q4) Solve <u>any two</u> : **[2 × 8 = 16]**

a) What is local or base PLC? Explain local expansion and remote I/O expansion.

b) i) Explain what are input and output status files in a PLC.

ii) Give the advantages of using software to program a PLC.

c) i) Explain the working of a bottle filling plant. Give the necessary ladder diagram.

ii) What type of battery is typically used in PLC processors? How should it be handled? How should it be disposed off?

Q5) Solve <u>any two</u> : **[2 × 8 = 16]**

a) Explain BIT or RELAY instructions for a PLC.

b) i) What information should be included in PLC documentation?

ii) Explain the sequencer output instruction (SQO).

c) Write short notes on <u>any two</u> of the following :

i) Solenoids.

ii) Recorders.

iii) Derivative control mode.

iv) Root locus-definition and applications.

Total No. of Questions : 5] **[Total No. of Pages : 2**

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[3829]-401
M.Sc.
ELECTRONIC SCIENCE
EL 4 - UT - 06 : Control Systems : Theory and Applications
(New Course) (Sem. - IV) (2008 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Solve any two : **[2 × 8 = 16]**

a) What is feedback control? Give a block diagram and explain its working. What is process load and process lag?

b) i) Explain feedforward control strategy.

ii) Compare feedback control with open loop control.

c) i) Explain significance of Laplace transform in the analysis of control systems.

ii) Give simple or canonical form of a block diagram. Obtain an expression for its transfer function.

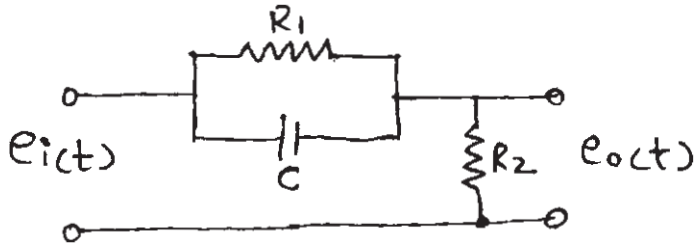
Q2) Solve any two : **[2 × 8 = 16]**

a) i) Define the term transfer function. State its advantages and limitations in the study of control systems.

ii) Give advantages and limitations of Routh's method for checking stability of control systems.

b) Explain the rules for block diagram reduction for a control system.

c) i) Obtain transfer function of the lead network shown below.



P.T.O.

Total No. of Questions : 5] **[Total No. of Pages : 2**

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[3829] - 31

M.Sc.

ELECTRONIC SCIENCE

EL3-UT-05 : DSP Systems and Applications

(Sem.- III) (2004 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***

Q1) Attempt any two of the following. **[2 x 8 = 16]**

a) i) Check whether the following system is linear or not.

$y(n) = x(2n)$

ii) A discrete time signal is given by

$x(n) = \{1,1,1,1,2\}$

$\uparrow$

Sketch the following sequences.

1) $x(n+1)$, 2) $x(3-n)$.

b) What are linear and nonlinear systems? Determine whether the system described by the differential equation.

$$\frac{dy(t)}{dt} + y(t) + 4 = x(t)$$

is linear.

c) What are different ways of representing a discrete time signals? Explain any one in detail.

Q2) Attempt any two of the following. **[2 x 8 =16]**

a) Explain image processing technique with reference to DSP.

b) Explain the following with reference to DSP.

i) Barrel shifter, ii) MAC,

iii) ALU, iv) Program Sequencer.

P.T.O.

c) Draw the block diagram of a typical DSP system. Explain the function of each block.

Q3) Attempt any two of the following. **[2 x 8 = 16]**

a) What is an IIR filter? Discuss the direct form structure for the same.

b) Explain role of DSP in speech recognition and interference rejection.

c) What is Harvard and Neumann architecture? Which architecture is used in DSP? How the memory is provided on DSP board.

Q4) Attempt any two of the following. **[2 x 8 =16]**

a) Find the linear convolution of $X_1(n)$ and $X_2(n)$ using Z-transform.

$X_1(n) = \{1,2,3,4\}$
$\uparrow$
$X_2(n) = \{1,2,0,2,1\}$
$\uparrow$

b) Calculate the DFT of a sequence
$X(n) = \{1,1,0,0\}$ and check the validity of answer by calculating IDFT.

c) Determine the cross correlation values of the two sequences.
$x(n) = \{1,0,0,1\}$
and $h(n) = \{4,3,2,1\}$

Q5) Attempt any two of the following: **[2 x 8 = 16]**

a) Draw the block diagram of analog to digital converter. Explain process of quantization in detail. Describe quantization error.

b) Determine the Z-transform including the region of convergence of

$$x(n) = \begin{cases} a^n, & n \geq 0 \\ 0, & n < 0 \end{cases}.$$

c) i) Compute the DFT of four point sequence $X(n) = \{0,1,2,3\}$

ii) What are different design techniques available for FIR filters? List advantages of FIR filters over IIR filters.

Total No. of Questions : 5] **[Total No. of Pages : 2**

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[3829] - 41

M.Sc.

ELECTRONIC SCIENCE

EL4-UT-06 : Control Systems : Theory and Applications

(Old Course) (Sem.- IV) (2005 Pattern)

Time : 3 Hours] ***[Max. Marks : 80***

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of log-tables, calculator is allowed.***

Q1) Solve any <u>two</u>. **[2 x 8 = 16]**

a) Give a neat block diagram and explain the working of a feedback control system. Explain the following terms in this regard.

-Process load - Process lag - Self regulation.

b) i) Compare continuous and discrete state process control systems.

ii) Unit impulse response of a system is e^{-7t}. Find its transfer function.

c) Explain block diagram reduction rules.

Q2) Solve any <u>two</u>. **[2 x 8 = 16]**

a) Explain open-loop transient response method for process loop tuning.

b) Explain what is root locus with suitable examples. What is its use in control system design.

c) i) Explain the use of Laplace transform in control system analysis.

ii) Explain Routh's stability criterian.

Q3) Solve any <u>two</u>. **[2 x 8 = 16]**

a) Explain in detail proportional and derivative control modes. Give their applications.

P.T.O

b) With a general block diagram explain the working of a PLC. What are the input and output status files?

c) i) Explain serial communication between PC and PLC.

ii) Transfer function of a system is given by

$$T(s)=\frac{(s+8)}{s(s+2)(s+5)(s^2+7s+12)}$$

Determine poles, zeroes, characteristic equation and pole zero plot.

Q4) Solve any <u>two</u>. **[2 x 8 = 16]**

a) Explain different types of PLC programming terminals. What are their advantages and limitations?

b) i) Explain the 'ON-Delay' timer instruction.

ii) Give the symbols of various switches and other elements used in a ladder diagram.

c) i) A small electric furnace has two heating elements. When switched ON first element starts and after two minutes the second starts. A temperature sensor is used to shut down the furnace if overheating occurs. Prepare the ladder diagram for this furnace.

ii) What is the use of a watchdog timer in PLC?

Q5) Solve any <u>four</u>. **[4 x 4 = 16]**

a) Describe data formats used in a PLC.

b) Compare open-loop and feedback control systems.

c) Explain how to 'document' a PLC system.

d) Describe construction and working of a solenoid.

e) Describe a bottle filling plant as a discrete state control system.