Total No. of Questions : 8]

SEAT No. :

P2770

[Total No. of Pages : 3

[4834] - 101

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

ELIUT01 : Mathematical Methods in Electronics and Network Analysis

(2013 Pattern) (Credit System)

Time :3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) *Attempt any five questions.*
2) *All questions carry equal marks.*
3) *Use of non-programmable calculator is allowed.*

Q1) Answer the following :

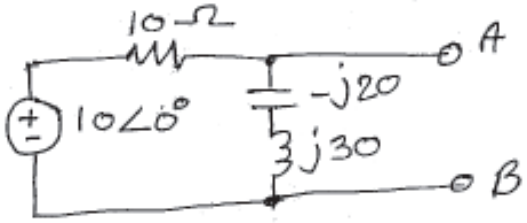
a) "Mechanical Physical quantities can be shown to be analogous to electrical quantities". Elaborate statement using appropriate examples. **[4]**

b) What is meant by ordinary differential equation? What is the order of differential equation? Give an example of second order ODE. **[3]**

c) Define the terms - Network, Branch mesh or loop. **[3]**

Q2) Answer the following :

a) Find the load impedance required to be connected across A and B for maximum power transfer in the following Network. **[4]**



b) What is meant by partial differential equation? Give example of PDE in Physics. **[3]**

c) Which mathematical methods of modelling are used in electronic applications. List some applications. **[3]**

P.T.O.

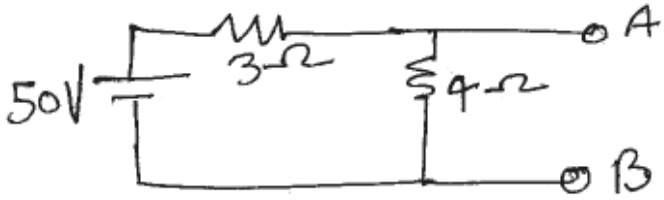
Q3) Answer the following :

a) Plat the pales and zeros in the S-plane for the following network functions **[4]**

i) $F(s)=\frac{s^2+4s+3}{s^2+2s}$ ii) $F(s)=\frac{(s+2)(s^2+9)}{(s^2+4)(s^2+4s+5)}$

b) Write a Bessel differential equation. List at least 4 applications at Bessel's equation in Physics and Electronics field. **[3]**

c) Determine the Norton equivalent circuit for the circuit shown below **[3]**



Q4) Answer the following :

a) For the given denominator polynomial of a network function determine the value of k for which network to stable. **[4]**

$Q(s) = s^2 + 2s^2 + 4s + k$

b) Determine the transfer function of high pass passive RC filter. **[3]**

c) Obtain delta connected equivalent circuit for star circuit with resisters. $R_A = 10\Omega$, $R_B = 20\Omega$, $R_C = 5\Omega$. **[3]**

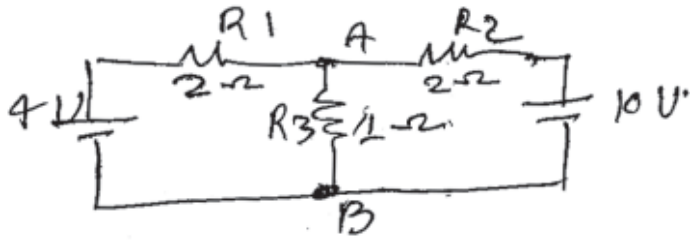
Q5) Answer the following :

a) Draw a block diagram at two part network. Define voltages, current, transfer admittance and transfer impedance functions. **[4]**

b) Find the general solution for the differential equation **[3]**

$$\frac{d^3x}{dt^2} - 6\frac{d^2x}{dt^2} + 32x = 0$$

c) Find the current and voltage in resistor R3 of the following network. **[3]**



Q6) Answer the following :

a) Determine the impulse response h(n) for the system described by

$y(n) - 3y(n-1) - 4y(n-2) = x(n) + 2x(n-1)$ **[4]**

b) In a series RLC circuit, there is no initial charge on capacitor. If switch is closed at $t = 0$. Find the resulting current R = 2Ω, L = 1H, C = 0.5F and input voltage is 10V. **[3]**

c) The coordinates of a point in Cartesion system are (8.66, 5, 13.74). Determine its coordinates in spherical coordinate system. **[3]**

Q7) Answer the following :

a) What is meant by state variables? What is the need of it? What are State equations? What is the advantage of state variable method over transfer function in modelling a system. **[5]**

b) Write a wave equation in cylindrical co-oridnate system. Seperate the variables. **[5]**

Q8) Answer the following :

a) State convolution theorem. Using convolution theorem, determine the inverse Laplace transform of the following network function **[5]**

$$F(s)=\frac{1}{s^2\left(s^2-9\right)}$$

b) Define Z-transform, inverse Z transform and Region at convergence. Determine the Z transform of Signal $x(t) = e^{-at}$. **[5]**

✦✦✦✦

Total No. of Questions : 8]

SEAT No. :

P2771

[Total No. of Pages : 4

[4834] - 102

M.Sc. (ELECTRONIC SCIENCE) (Semester - I)

EL1UT02 : Analog Circuit Design

(2013 Pattern) (Credit System)

Time :3 Hours] *[Max. Marks :50*

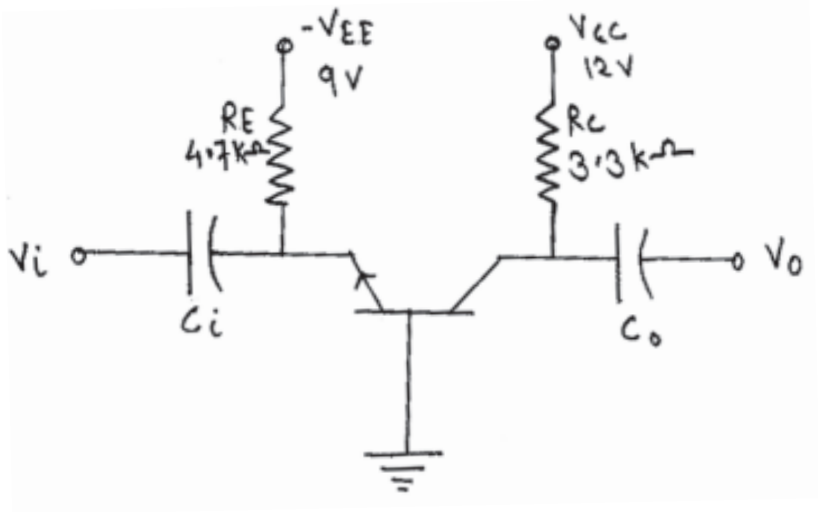
Instructions to the candidates:

1) ***Answer any five questions.***
2) ***All the questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Use of log table / non-programmable calculator is allowed.***

Q1) Answer the following questions :

a) What is Clipper? With the help of circuit diagram and waveform, describe the operation of biased clipper. **[4]**

b) Find the input impedance, output impedance and voltage gain for the common base circuit as shown in fig. Assume V_{BE} = 0.6V. **[3]**



c) In the BJT Hartley oscillator, two inductances are 1 mH and 10 μH, While the frequency is to be changed from 950 KHz to 2050 KHz. Calculate the range over which the capacitor is to be varied. **[3]**

P.T.O.

Q2) Answer the following questions :

a) What are hybrid parameters for two post network? Draw the hybrid models for transistors in three different configurations. **[4]**

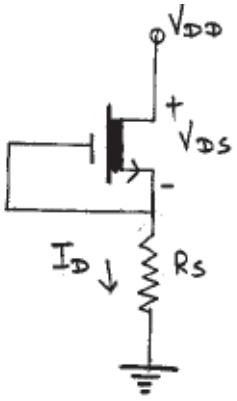
b) The input to the differentiator circuit is a sinusoidal voltage of peak value 4 mV and frequency 1 kHz. Find the output voltage, if R = 50 kΩ and C = 1 μf. **[3]**

c) Discuss the comparison of double tuned and stagger tuned amplifier. **[3]**

Q3) Answer the following questions :

a) Draw the A.C. equivalent circuit of a CE amplifier with voltage divider bias using h-parameter model and derive the equations for current gain and voltage gain. **[4]**

b) State types of biasing. For N-Channel depletion mode MOSFET given below, $V_{TN} = -2V$, $K_N = 0.2$ mA/V^2. Assume that $V_{DD} = 10V$ and $R_S = 5k\Omega$. Determine I_D and V_{DS}. **[3]**



c) Draw the circuit diagram of practical integrating circuit using Op-amp and give its designing steps. **[3]**

Q4) Answer the following questions :

a) Define and explain the parameters : transconductance gm, drain resistance R_d and amplification factor μ of a JFET. Establish the relation between them. **[4]**

b) Discuss the classification of tuned amplifier and give the applications of class-C tuned amplifier. **[3]**

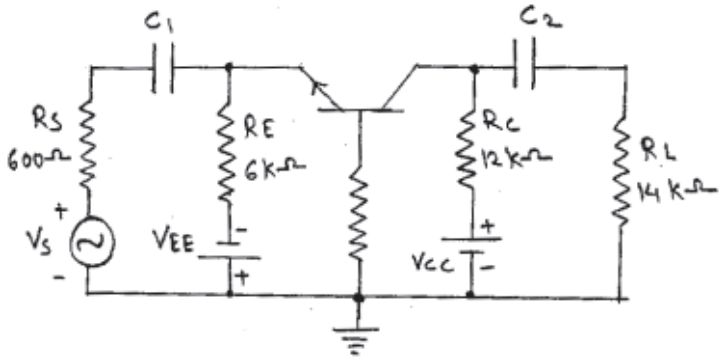
c) Draw the diagram of an Instrumentation amplifier using 3 Op-amp and derive the expression for the output voltage. **[3]**

Q5) Answer the following questions :

a) A circuit has coil of inductance 120 μH and resistance of 15.7 Ω, which is connected in series with a capacitor of 211 pF. Determine the resonant frequency, voltage drop across R at resonance and the quality factor Q of the coil. Assume that the impressed voltage is 0.157 V. **[4]**

b) With circuit diagram, explain the working of single stage BJT CE amplifier. Give the characteristics of it. **[3]**

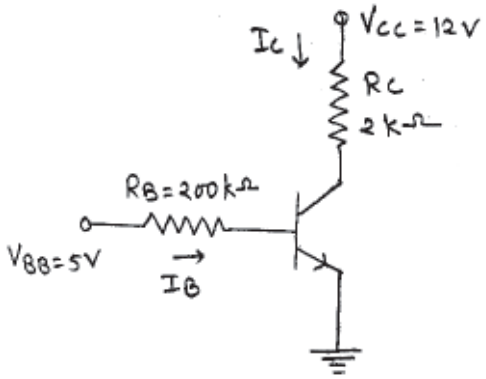
c) Calculate the value of input resistance, current gain and voltage gain for the common base amplifier shown below. The transistor parameters are h_{ib} = 24Ω, h_{fb} = 0.98, h_{ob} = 0.49 mA/V and $h_{rb} = 2.9 \times 10^{-4}$. **[3]**



Q6) Answer the following questions :

a) Design a wide band pass filter for f_L = 100 Hz, f_H = 1 kHz and pass band gain = 4. **[4]**

b) Determine the base, collector and emitter currents and V_{CE} for a CE circuit shown below for V_{CC} = 12V, V_{BB} = 5V, R_B = 100 kΩ, R_C = 2 kΩ, V_{BE} (on) = 0.7 V, β = 100. **[3]**



c) What is a advantageous feature of crystal oscillator? Explain the Miller crystal oscillator. **[3]**

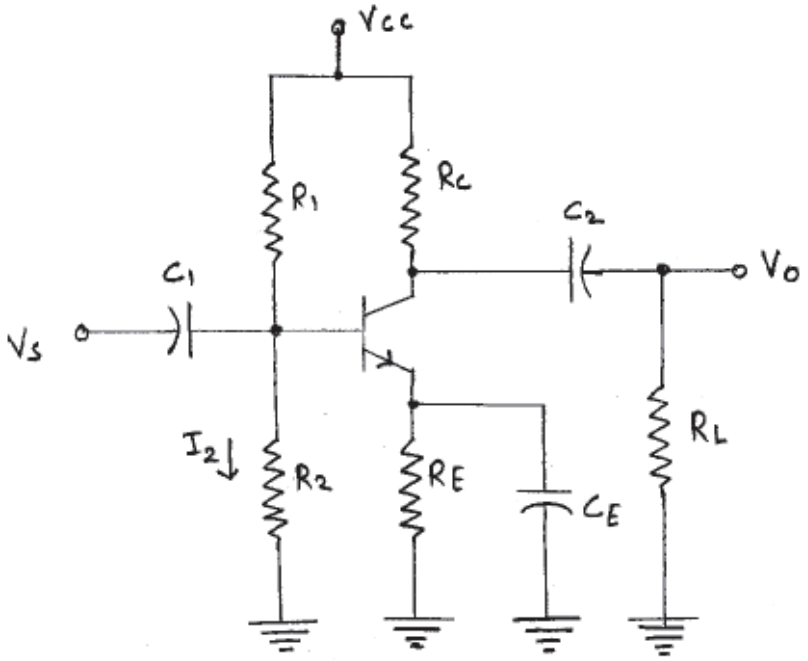
Q7) Answer the following questions :

a) Explain the terms static resistance and dynamic resistance. Find the value of dc resistance and ac resistance of a germanium junction diode at 25°C with I_o = 20 μA and at an applied voltage of 0.2 V across the diode. **[5]**

b) Explain Colpitt's oscillator with circuit diagram. Derive the expression for frequency of oscillation. **[5]**

Q8) Answer the following questions :

a) Design a single stage RC coupled BJT amplifier circuit as shown below. Assume that V_{CC} = 12 V, I_C = 5 mA, h_{fe} = 100, h_{ie} = 1kΩ, R_L = 100 kΩ and f_L = 100 Hz. **[5]**



b) Obtain the expression for input impedance and output impedance with negative feedback for non-inverting amplifier. **[5]**

Total No. of Questions : 8]

SEAT No. :

P2772

[Total No. of Pages : 2

[4834] - 103

M.Sc. (Semester - II)

ELECTRONIC SCIENCE

EL1UT03 - Digital System Design

(2013 Pattern) (Credit System)

Time :3. Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any <u>FIVE</u> questions.***
2) ***All questions carry equal marks.***

Q1) a) Explain any four data types in verilog with example. **[4]**

b) Design 4 to 2 priority encoder. **[3]**

c) Draw and explain logic block of typical FPGA. **[3]**

Q2) a) List different types of operators in verilog.Explain any three with suitable example. **[4]**

b) Implement F (A,B,C,D) = Σ m (1,2,4,7) using 8 to 1 multiplexer. **[3]**

c) State the advantage of using PLD over fixed function ICS. List various types of PLDs. **[3]**

Q3) a) Write verilog codes for 4 to 1 multiplexer using i) Gate level modeling

ii) conditional operator. **[4]**

b) Explain with circuit diagram 4-bit even parity generator and checker. **[3]**

c) Explain the terms - state table, excitation table, Draw state diagram for T flip-flop. **[3]**

P.T.O.

Q4) a) Design 4 - bit magnitude comparator using verilog. **[4]**

b) Design 3 - bit synchronous up counter using T flip - flops. **[3]**

c) Explain with neat diagram write operation of SRAM cell. **[3]**

Q5) a) Write verilog code for stepper motor controller using FSM. **[4]**

b) Draw architecture of typical FPGA. Write two application areas of FPGA. **[3]**

c) Using K - map, obtain logical expression for segment b of BCD to seven segment decoder to drive common anode display. **[3]**

Q6) a) Explain the declaration of task with one example. **[4]**

b) Minimize following expression using k - map and realize using basic gates. $y = \Sigma m (1,5,6,7,11,12,13,15)$ **[3]**

c) Explain the procedure to design digital system using CPLD. **[3]**

Q7) a) Write verilog module for full adder. Write verilog code for 4 - bit full adder using this module, use structural modeling. **[5]**

b) What is finite state machine? Draw and explain state machine structure of mealy state machine. **[5]**

Q8) a) Write verilog code for RS latch. using NAND gate use gate level modeling. Write verilog code for JK flip - flop using behavioural modeling. **[5]**

b) Write three features of typical CPLD. List different CPLD devices. **[5]**

Total No. of Questions : 6]

SEAT No. :

P2773

[Total No. of Pages : 2

[4834] - 104

M.Sc. (Semester - I)

ELECTRONIC SCIENCE

EL1UT04 : Advanced 'C' Programming

(2013 Pattern) (Credit System)

Time :2:30 Hours] *[Max. Marks :40*

Instructions to the candidates:

1) ***Attempt any four questions.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicates full marks.***

Q1) Answer the following.

a) Explain with example the rules of arithmatic operators precedence. **[4]**

b) State types of storage classes in C. Explain any one with example. **[3]**

c) Write a c - program to find roots of quadratic equation. **[3]**

Q2) Answer the following.

a) Write a c -program to delete the duplicate elements in an array. **[4]**

b) Write a c- program to add two numbers using pointers. **[3]**

c) Write c - program for structure that will read book title, author, subject of 4 books. **[3]**

Q3) Answer the following.

a) Explain with example the difference between call by value and call by reference. **[4]**

b) Give difference between structure and union. **[3]**

c) Write c - program to find length of string using pointer. **[3]**

P.T.O.

Q4) Answer the following.

a) Write c - program to draw the symbol of operational Amplifier using graphics functions. **[4]**

b) Write c - program to b link the LED interfaced to the Do pin of the parallel port. **[3]**

c) Explain various functions available for the dynamic memory allocation. **[3]**

Q5) Answer the following.

a) Write a c - program to open a file and point its contents on screen. **[4]**

b) Write a short note on video graphics adopters. **[3]**

c) What is a data file? State and explain the two categories of data files. **[3]**

Q6) Answer the following.

a) Explain with example the concept of class and object. **[4]**

b) Explain the term 'function overloading'. **[3]**

c) Define inheritance. State different forms of inheritance in C++. **[3]**

Total No. of Questions : 8]

SEAT No. :

P2774

[Total No. of Pages : 2

[4834] - 201

M.Sc. (Semester - II)

ELECTRONIC SCIENCE

EL2UT05 : Applied Electromagnetics, Microwaves And Antennas

(2013 Pattern) (Credit System) (4 Credits)

Time :3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Attempt any Five questions.***
2) ***All the questions carry equal marks.***
3) ***Draw neat diagrams wherever necessary.***
4) ***Figures to the right indicate full marks.***
5) ***Use of non - programmable calulators is allowed.***

Q1) a) What are different power losses in wave guides? Explain. **[4]**

b) Explain Gunn effect with a proper schematic diagram of Gunn diode. **[3]**

c) Given a transmission line, how can we obtain its characteristic impedance and propagation constant? **[3]**

Q2) a) What are the applications of Klystron? Explain its working with a neat diagram. **[4]**

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

c) What are different types of optical fibres? with necessary diagrams, show their structure. **[3]**

Q3) a) 'Skin depth depends upon the frequency of the signal' , Explain with suitable examples. **[4]**

b) State the dielectric - dielectric boundary conditions and explain how these boundary conditions will change for dielectric - conductor boundary. **[3]**

c) With a neat diagram explain the open - out antenna & compare it with slot antenna. **[3]**

P.T.O.

Q4) a) Draw the schematic diagram of rectangular horn antenna and circular horn antenna. Discuss their directivity and field pattern with necessary diagrams. **[4]**

b) A Hertzian dipole antenna has a length of $\lambda/10$. Find its radiation resistance. **[3]**

c) Explain Friis equation (Transmission formula). **[3]**

Q5) a) Obtain the transmission line equations using suitable diagram. **[4]**

b) A uniform transmission line has the following values : R = 10mΩ /m, G = 1.5μ℧/m, L = 1.5μH/m and C = 1.6 nF/m at 10 KHz. Estimate its characteristic impedance. **[3]**

c) Starting with Maxwell's equations, obtain the expression for poynting theorem in frequency domain. **[3]**

Q6) a) Write the expressions for voltage and current waves travelling along a transmission line and obtain the expression for reflection coefficient at the load end. **[4]**

b) Explain the terms $TE_{m,n}$ and $TM_{m,n}$ for rectangular wave guides. **[3]**

c) Find the cut - off frequency of an air - filled rectangular wave guide with inner dimensions 19.6 cm × 19.6 cm. **[3]**

Q7) a) Obtain the general equation of α and β of a medium , given $\gamma = \sqrt{j\omega\mu(\sigma + j\omega t)}$ and γ = α + j β **[5]**

b) The reflection coefficient of a transmission line is $0.4\angle -42°$. Find its SWR. **[5]**

Q8) a) A uniform plane wave propagating in a medium has $\vec{E} = ze^{-\alpha z}\sin(10^8 t - \beta z)\hat{y}\ V/m$

If the medium has $E_r = 1, \mu_r = 20, \sigma = 3\ S/m,$ find its loss tangent and hence determine whether the medium is a good conductor or not for the given frequency ω. **[5]**

b) Obtain the expression for reflection coefficient Γ for a uniform planewave normally incident on the plane boundary between two dielectrics.Assume zero surface charge density and zero surface current density. **[5]**

Total No. of Questions : 8]

SEAT No. :

P2775

[Total No. of Pages : 3

[4834]-202

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT06: Instrumentation and Measurement Techniques

(2013 Pattern) (Semester - II) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***All questions carry equal marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figure to the right indicate full marks.***
5) ***Use of Non-programmable calculator is allowed.***

Q1) a) State the different methods of measurement. Give the classification of instrument. Distinguish between deflection and null type instrument. **[4]**

b) Discuss the factors influence the choice of transducer for the measurement of physical parameter. **[3]**

c) Define gauge factor of a strain gauge. A resistance wire strain gauge with a gauge factor of 2 is bonded to a steel member subjected to stress of 100 MN/m^2. The modulus of elasticity of steel is 200 GN/m^2. Calculate the % change in the value of gauge resistance due to supplied stress.**[3]**

Q2) a) Give definition and significance of measurement. Explain the application of measurement system in detail. **[4]**

b) State different static and dynamic characteristics of measurement system. Explain each with suitable example. **[3]**

c) The output voltage of LVDT is 1.5V at maximum displacement at a load of 0.5 mΩ, the deviation from linearity is maximum and it is ± 0.003V from straight line through origin. Find the linearity at the given load. **[3]**

P.T.O.

Q3) a) What are the different types of measurement errors? Write note on each type of error, mentioning the causes of the error. **[4]**

b) Explain the advantages and limitations of potentiometer transducer used for displacement measurement. **[3]**

c) A multimeter having a sensitivity of 2000 Ω/V is used for the measurement of voltage across a circuit having an O/P resistance of 10 kΩ. The open circuit voltage of the circuit is 6V. Find the reading of the multimeter when it is set to its 10V range. Find the % error, comment on the result. **[3]**

OR

Q4) a) Draw the equivalent circuit of piezo electric transducer. Describe different modes of operation of piezo electric transducer., "For medium and high frequencies, the magnitude of voltage across loads is independent of frequency" comment. **[4]**

b) A resistance thermometer is to be constructed of nickel wire. Thermometer resistance at 20ºC is 100Ω. What length of 0.4 mm diameter wire should be used. What would be the length of 2 mm diameter wire is used? (resistivity = 0.8 Ωm). If the resistance varies linearly with temperature then what would be the resistance at t = -50ºC and 100ºC? (sensitivity = 0.2 Ω/ºC) **[3]**

c) What are the basic blocks of a generalized measurement system? Draw the block diagram and explain function of each block. **[3]**

Q5) a) List the transducer used for pressure measurement. With neat diagram explain the working principle of thermal conductivity gauge used for very low pressure measurement. **[4]**

b) What are the standard inputs for studying the dynamic response of a system? **[3]**

c) A 6.25 mm long Resistance Temperature Detector (RTD) with a steady state gain of 0.3925 Ω/ºC and a time constant of 5.5 sec. experience a step change of 75ºC in temperature. Before the temperature change, it has a stable 100Ω resistance. Write the time domain equation for resistance and find its value after 15sec. of application of step input. **[3]**

Q6) a) Describe the working principle of : **[4]**

i) McLeod gauge.

ii) Electromagnetic Flow Meter.

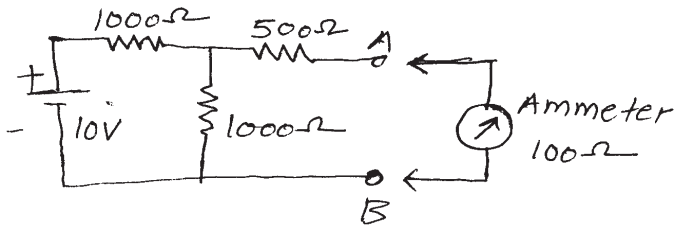
b) It is desired to measure the value of current in the 500Ω resistor as shown in figure below by connecting 100Ω ammeter. **[3]**

Find:

i) Actual value of current.

ii) Measured value of current, and

iii) the percentage error in measurement and accuracy.



c) Derive an expression for frequency response of a second order system. Draw the magnitude and phase verses frequency plots. **[3]**

Q7) a) State different types of strain gauges. Describe the construction of two types of strain gauges with neat diagram. State their advantages. **[5]**

b) State applications of the pitot-static tube. A pitot tube is used to measure the velocity of air stream at 20°C and 0.1 MPa. If the velocity is 10 m/s. What is the dynamic pressure in newton per square meter? What is the uncertainty of the velocity measurement and percentage uncertainty. If the dynamic pressure is measured with manometer having an uncertainty of 1 Pa? **[5]**

Q8) a) List different transducers for displacement measurement. State advantages and limitations of LVDT. The output of an LVDT is connected to 5V voltmeter through an amplifier whose amplification factor is 250. An output of 2 mV appears across the terminal of LVDT when core moves through distance 0.5 mm. Calculate the sensitivity of LVDT and that of hole setup. The milli voltmeter scale has 100 divisions. The scale can be read to 1/5 of a division. Calculate the resolution of the instrument in mm. **[5]**

b) Describe the construction and working of thermocouple. State the advantages and disadvantages of thermocouple. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P2776

[Total No. of Pages : 2

[4834] - 203

M.Sc. (Part - I) (Semester - II)

ELECTRONIC SCIENCE

EL2UT07 : Embedded System Design

(2013 Pattern) (Credit System) (4 - Credits)

Time :3. Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any Five questions.***
2) ***All questions carry equal marks.***
3) ***Neat diagram must be drawn wherever necessary.***
4) ***Figures to the right side indicate full marks.***
5) ***Use of non- programmable calculator is allowed.***

Q1) a) Write the difference between Harvard and von- Neumann architecture. **[4]**

b) With the help of neat diagram, explain serial peripheral interface (SPI) in short. **[3]**

c) Write an AVR 'C' program to monitor bit 5 of port C. If it is high, send 55H to port B; otherwise send AAH to port B. **[3]**

Q2) a) Draw the architecture of PIC microcontroller. **[4]**

b) What is an embedded system? List the features of it. **[3]**

c) Explain how PWM signals can be generated using timer 0 of AVR microcontroller. **[3]**

Q3) a) Write a AVR 'C' program to toggle only the PORTB. 4 bit continuously after every 70μs. Use timer 0, Normal mode and 1.8 prescalar to create the delay (XTAL = 8 MHz) **[4]**

b) Explain any three arithmetic instructions of PIC microcontroller with suitable example. **[3]**

c) Explain in short In - Circuit - Emulator (ICE). **[3]**

P.T.O.

Q4) a) What is ZigBee bus standard? Describe FFD and RFD in short. **[4]**

b) Write the features of At mega 16 microcontroller. **[3]**

c) Write a PIC 'C' program to get a byte of data from port C.If it is less than 100, send is to port B: otherwise send it to port D. **[3]**

Q5) a) Describe any two software tools used for development of embedded system. **[4]**

b) With the help of diagram, explain RS485 bus standard in short. **[3]**

c) Write any three addressing modes of AVR microcontroller with suitable example. **[3]**

Q6) a) Write a PIC 'C' program to gets data from channel 0 (RAO) of ADC and display the result on port C and port D after some fix period continuously. **[4]**

b) Write a short note on reduced instruction set computer (RISC) **[3]**

c) Describe the controller area network (CAN) frame format in short. **[3]**

Q7) a) Explain the AVR At mega 16 microcontroller status register in short. **[4]**

b) Draw the block diagram of LCD interfacing to PIC microcontroller. Write an algorithm to display message on first line of 16× 2 LCD. **[3]**

c) Explain the development steps of embedded system design in short. **[3]**

Q8) a) What is I2C? with the help of timing diagram explain data transfer using I2C? **[4]**

b) Write an AVR assembly language program to create a square wave of 50% duty cycle on bit 0 of port C. **[3]**

c) Explain any three instructions related to flag bits of PIC microcontroller. **[3]**

Total No. of Questions : 6] **SEAT No. :**

P2777 **[Total No. of Pages : 2**

[4834]-204

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT08: Foundation of Semiconductor Devices

(2013 Pattern) (Semester - II) (Credit System)

Time : 2½ Hours] ***[Max. Marks : 40***

Instructions to the candidates:

1) ***Answer any Four questions.***
2) ***All questions carry equal marks.***
3) ***Neat diagrams must be drawn wherever necessary.***
4) ***Figures to the right indicate full marks.***

Q1) a) Obtain the wavefunction for the particle in the infinite potential well using Schrodinger's wave equation. Show that the energy of particle can have only particular discrete values. **[4]**

b) Obtain expression for electron diffusion current density and hole diffusion current density in a semiconductor. Show the graphically the electron and hole concentration as a function of distance. **[3]**

c) Discuss the difference between HBT and BJT with its construction, working, advantages and limitations. **[3]**

Q2) a) What is difference between a primitive cell and a unit cell? What is the utility of both the concept? **[4]**

b) How p-n junction is formed? What is meant by a buit-in potential barrier and how it is important? **[3]**

c) Calculate quasi-Fermi energy levels of an n-type semiconductor at T = 300 K with carrier concentrations of $n_o = 10^{17}cm^{-3}$, $n_i = 10^{10}\ cm^{-3}$ and $p_o = 10^{7}\ cm^{-3}$. In nonequilibrium, assume that the excess carrier concentrations are $\delta_n = \delta_p = 10^{12} cm^{-3}$. Hence comment about quasi-Fermi levels for electrons and holes. Given $K = 8.62 \times 10^{-5}$ ev/K. **[3]**

P.T.O.

Q3) a) Explain junction terminology of JFET, with behaviour of I-V characteristics zero-gate voltage, for small and large drain current and a drain voltage to achieve pinchoff at the drain terminal. Give necessary mathematical relationships. **[4]**

b) Explain the concept of effective mass of electron in semiconductor material. **[3]**

c) Calculate the de-Broglie Wavelength for

i) an electron with kinetic energy 1 ev

ii) a particle with kinetic energy of 1 ev having mass 5×10^{-31} kg.

iii) a 2000 kg truck travelling with speed of 20 m/s.

comment on result.

Given $h = 6.625 \times 10^{-34}$ J.S.

$m_e = 9.11 \times 10^{-31}$kg. **[3]**

Q4) a) Explain Hall-Effect, give necessary mathematical expressions for Hall voltage. **[4]**

b) Define Fermi Energy. Explain Fermi-Dirac distribution function in detail. **[3]**

c) A silicon PN junction at T = 300 K with $n_i = 1.5 \times 10^{10}cm^{-3}$ assume the n-type doping is 1×10^{16} cm^{-3} and assume that a forward bias of 0.70 V is applied to the PN junction. Calculate the minority carrier hole concentration at the edge of space charge region.

Given $K = 8.62 \times 10^{-5} \frac{eV}{K} = 1.38 \times 10^{-23}$ J/K. **[3]**

Q5) a) Explain Eber-moll model for BJT. How it is used to define equations for I_E and I_C. Draw basic Eber-moll equivalent circuit. **[5]**

b) In a p^+-n junction, the doping N_d is doubled state changes in following parameter with comment. **[5]**

i) Junction capacitance.

ii) Buit in potential.

iii) Break down voltage.

Q6) a) Why surface effects in a semiconductor are generated? Explain distribution of surface state within forbidden band gap. **[5]**

b) Explain Ideal Current-voltage relation for n-channel MOSFET for i) enhancement mode ii) depletion-mode. **[5]**

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M.Sc. (Semester - III)

ELECTRONIC SCIENCE

EL3UT09 : Communication Electronics

(2013 Pattern) (Credit System)

Time :3 Hours] *[Max. Marks :50*

Instructions to the candidates:

1) ***Answer any Five questions.***
2) ***Neat diagram must be drawn wherever necessary.***
3) ***Figures to the right indicates full marks.***

Q1) a) Draw and explain the block diagram of superheterodyne receiver in short. **[4]**

b) Write the drawbacks of delta modulator and explain the working of adaptive delta modulator. **[3]**

c) Explain the directivity and power gain of an antenna. **[3]**

Q2) a) With the help of diagram, explain any two types of couplers used in optical fiber communication. **[4]**

b) For amplitude modulation (Am), prove that. $P_t / P_c = 1 + \frac{m^2}{2}$. **[3]**

c) Draw the SDLC basic frame format and explain the function of each field in short. **[3]**

Q3) a) With the help of neat diagram,explain the working of antenna Π coupler. **[4]**

b) Describe the IrDA module and write its specifications. **[3]**

c) With the help of block diagram, explain the working of single side band generation using phase shift method. **[3]**

P.T.O.

Q4) a) Describe any two different codes used for data transmission and write their strengths and weaknesses. **[4]**

b) Explain the adaptive array smart antenna system in short. **[3]**

c) Explain the working of local loop of landline telephone in short. **[3]**

Q5) a) Draw the circuit diagram of balanced slope detector and explain its working in short. **[4]**

b) With the help of block diagram, Explain the working of phase shift keying (PSK) modulator in short. **[3]**

c) With the help of diagram, Explain the microwave space wave propagation in short. **[3]**

Q6) a) Draw the block diagram of satellite transponder front end and explain each block in short. **[4]**

b) Write the advantages of RF amplifier and explain the term sensitivity and selectivity. **[3]**

c) With reference to pulse code modulation (PCM), Explain the terms i) sampling ii) Quantisation iii) Encoding. **[3]**

Q7) a) Describe the log periodic antenna. Write its features. **[4]**

b) Describe any two applications of ISDN in short. **[3]**

c) What is AGC? with the help of circuit diagram, explain the working of it. **[3]**

Q8) a) What is pulse time modulation (PTM.) Explain its types in short. **[4]**

b) With the help of diagram, describe the discone antenna. **[3]**

c) Describe bluetooth technology in short. **[3]**

Total No. of Questions : 8]

SEAT No. :

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M.Sc. - II (Semester - IV)

ELECTRONIC SCIENCE

EL4UT10 : Control Systems

(2013 Pattern) (4 Credits) (Credit System)

Time :3 Hours] *[Max. Marks :50*

Instructions to the candidates:

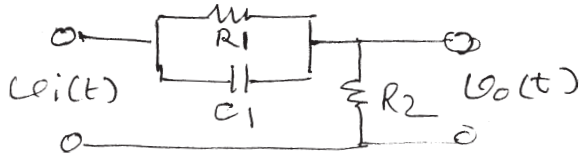
1) ***Answer any Five questions.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Draw neat diagrams wherever necessary.***
5) ***Use of non - programmable calculator is allowed.***

Q1) a) Draw a block diagram of closed loop system. State advantages and disadvantages of closed loop systems. **[4]**

b) Draw a pole zero diagram of the transfer function $T(s) = \frac{s^2+1}{s^2+2s+1}$. **[3]**

c) What is derivative overrun in PID control? **[3]**

Q2) a) Obtain transfer function of the following phase lead circuit. **[4]**



b) Explain the terms; process load and process lag. **[3]**

c) Explain the working of synchro - servo motor. **[3]**

Q3) a) Explain reverse and direct action of a controller in process control application. **[4]**

b) Write a short note on pneumatic actuator. **[3]**

c) What is meant by SCADA supervisory control? **[3]**

P.T.O.

Q4) a) What is the need of annunciator? Explain with the help of suitable example. **[4]**

b) Compare open loop and closed loop system. **[3]**

c) Examine the stability of a system with characteristic equation.

$s^3 + 4s^2 + s + 16 = 0$. **[3]**

Q5) a) State advantages and disadvantages of Bode plot method. **[4]**

b) Discuss root locus stability criterion. **[3]**

c) What is two position mode in discontinuous controller? What is the need of neutral zone? **[3]**

Q6) a) What is PD control ? Explain with the help of mathematical expression. **[4]**

b) State the advantages and disadvantages of block diagram method. **[3]**

c) Discuss Ziegler - Nichols method used for process loop tuning in brief. **[3]**

Q7) a) With the help of appropriate diagrams explain the terms; minimum area and quarter amplitude criterion to evaluate control system response. **[5]**

b) Explain Nyquist stability criterion to determine the stability of control system. What are the advantages of Nyquist method. **[5]**

Q8) a) Using suitable diagram explain position control system. **[5]**

b) An integral controller is used for temperature control in the range of 0°C to 250°C with a set point 150°C. At zero error, the controller output is 20%. Reset rate is 0.1% second per % error. If temperature jumps to 180°C, calculate the controller output after 5 seconds. **[5]**