

Total No. of Questions : 8]

SEAT No. :

P2683

[5034]-101

[Total No. of Pages : 3

M.Sc. - I

ELECTRONIC SCIENCE

**EL1UT01 : Mathematical Methods in Electronics and Network
Analysis**

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

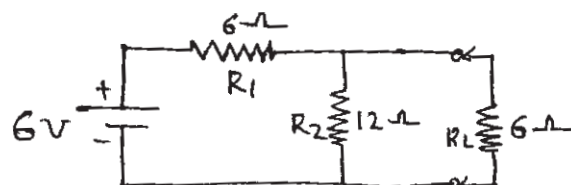
- 1) *Answer any five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right side indicate full marks.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) Answer the following:

- a) State and explain different types of modelling. Explain any one with suitable example. [4]
- b) Explain the terms graph, tree and node of network. [3]
- c) Explain the terms ordinary and partial differential equation. Give an example of each. [3]

Q2) Answer the following:

- a) Draw a circuit diagram of op-amp first order butterworth low-pass filter. Determine its transfer function in S-domain. [4]
- b) What are the order and degree of differential equations? Give examples of each. What is meant by linear differential equation? [3]
- c) Draw Thevenin's equivalent and find the voltage across R_L in the following circuit. [3]



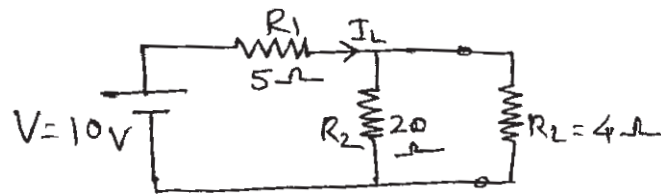
P.T.O.

Q3) Answer the following:

- Examine the stability of given equation using Routh's method.
 $s^3 + 4s^2 + s + 16 = 0$ [4]
- Determine the unit step response to the series R-L circuit using differential equation. [3]
- T-equation of a resistive network is characterised by $Z_a = 2\Omega$, $Z_b = 2.5\Omega$ and $Z_c = 5\Omega$. Obtain its Π equation. [3]

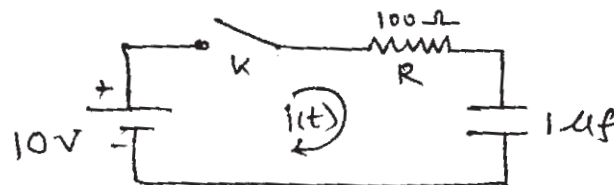
Q4) Answer the following:

- Show that Laplace transform of $f'(t) = SF(s) - f(0)$. Find the Laplace transform of $f(t) = Ae^{-at}$ and $f(t) = \sinh at$. [4]
- The co-ordinates of a point in Cartesian co-ordinates system are (3,4,12). Determine co-ordinates in cylindrical co-ordinate system. [3]
- Draw Norton's equivalent and find the current I_L in the following circuit. [3]



Q5) Answer the following:

- In given circuit switch K is closed at $t = 0$. Find the values of i , $\frac{di}{dt}$ and $\frac{d^2i}{dt^2}$ at $t = 0^+$. [4]



- Solve $\frac{d^2x}{dt^2} = -\frac{k}{m}x$, where k & m both are constants. [3]

c) Find the inverse Laplace transform of $F(s) = \frac{2s+5}{s^2+5s+6}$. [3]

Q6) Answer the following:

a) The z-transform of a sequence $x(z)$ is given by $x(z) = \frac{z-1}{1-3z^{-1}}$, $|z| < 3$
Determine the first three terms of the sequence. [4]

b) State final value theorem. Using this theorem determine the final value of

$$I(s) = \frac{s+6}{s(s+3)}. \quad [3]$$

c) Draw the poles and zeros for the current $I(s)$ in a network given by

$$I(s) = \frac{3s}{(s+2)(s+4)}. \quad [3]$$

Q7) Answer the following:

a) Find inverse z-transform.

$$x(z) = \frac{z}{z-1}, \quad |z| > 1 \quad [5]$$

b) Find $L^{-1} \left\{ \frac{1}{s(s^2+9)} \right\}$ using convolution theorem. [5]

Q8) Answer the following :

a) Separate the variables of 2-dim. Laplace equation in cartesian co-ordinate systems and hence obtain the solution for it. [5]

b) What is the need of modelling? State different types of mathematical modelling. Explain any one with suitable example. [5]



Total No. of Questions : 8]

SEAT No. :

P2684

[5034]-102

[Total No. of Pages : 3

M.Sc.

ELECTRONIC SCIENCE

**EL1 UT02 : Analogue Circuit Design
(2013 Pattern) (Semester - I) (Credit System)**

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) Answer any five questions.
- 2) All questions carry equal marks.
- 3) Use of log tables or non-programmable calculators is allowed.

Q1) Answer the following questions:

- a) Draw the approximate CE hybrid model. Using this model obtain the expression for current gain and input impedance. **[4]**
- b) In a colpitts oscillator, determine the impedances Z_1 , Z_2 and Z_3 . Using these in the general equation of oscillator, obtain the expression for frequency of oscillations. **[3]**
- c) Compare the RC coupling scheme with transformer coupling scheme. **[3]**

Q2) Answer the following questions:

- a) Draw the diagram of an active high-pass filter. Design the same for cut-off frequency 2kHz and pass-band gain of 2. **[4]**
- b) Draw a precision half wave rectifier circuit and explain its working. **[3]**
- c) Explain the diode current equation. Determine the voltage at which a Ge diode attains 75% of its saturation value at room temperature. **[3]**

Q3) Answer the following questions:

- a) Draw the circuit diagram of CE amplifier (BJT) with $R_B = 100 \text{ k}\Omega$, $R_C = 1 \text{ k}\Omega$, $\beta = 100$, $V_{BB} = 4 \text{ V}$, $V_{CC} = 10 \text{ V}$. Determine I_B and I_C . **[4]**

P.T.O.

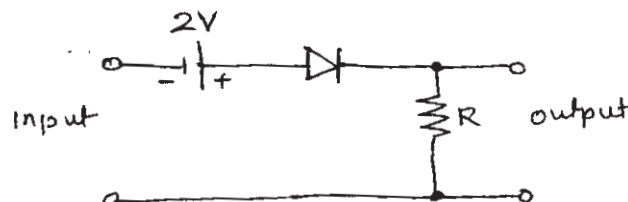
- b) Draw the diagram of voltage divider bias circuit with emitter resistor and obtain the expression for its 'stability factor' S. [3]
- c) Compare JFET and BJT. [3]

Q4) Answer the following questions:

- a) A JFET common drain amplifier has $R_s = 5k\Omega$, $R_G = 8M\Omega$, $\mu = 40$, $r_d = 25k\Omega$. Evaluate A_v (voltage gain) and Z_i (input impedance). Draw the necessary circuit diagram. [4]
- b) What is Darlington transistor connection? What is its feature? Draw its diagram. [3]
- c) What is crossover distortion? [3]

Q5) Answer the following questions:

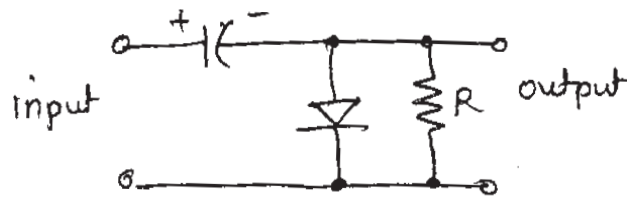
- a) A common emitter amplifier has $h_{ie} = 1000\Omega$, $h_{re} = 0.0002$, $h_{fe} = 100$ and $h_{oe} = 50\mu A/V$.
The load resistance is 1000Ω . Determine current gain and input resistance. [4]
- b) Compare zener breakdown and avalanche breakdown in a PN junction. [3]
- c) Determine the output waveform for the following circuit, if a $30V$ ^{peak-to-peak} sinusoidal waveform is given to the input. Neglect the diode drop. [3]



Q6) Answer the following questions:

- a) Draw the diagram of an Instrumentation Amplifier using three op-amps and obtain the expression for its output. [4]

- b) Determine the output of the following circuit, if a sinusoidal input of 5 volts peak - to - peak is applied to it. [3]



- c) An OP-AMP has CMRR of 1,00,000. Its differential mode gain is 10^5 . Determine the common mode gain. [3]

Q7) Answer the following questions:

- a) What are tuned amplifiers? Draw the equivalent circuit of single tuned amplifier and obtain the expression for resonant frequency gain. [5]
- b) Draw the diagram of a second order low pass Butterworth filter. Explain the design steps for cut-off frequency 5kHz. [5]

Q8) Answer the following questions :

- a) Draw the diagram of single stage RC coupled amplifier using BJT. If $V_{CC} = 12V$, $I_C = 5mA$, $h_{fe} = 100$, $h_{ie} = 1 k\Omega$, $R_L = 120 k\Omega$ and $f_L = 100 Hz$, determine R_1 , R_2 , R_C and R_E . [5]
- b) What is a PLL? Draw the block diagram of a PLL & explain its working. What are lock range and capture range? [5]



Total No. of Questions : 8]

SEAT No. :

P2685

[Total No. of Pages : 3

[5034]-103

M.Sc.-I

ELECTRONIC SCIENCE

EL1UT-03 : Digital System Design

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

- 1) *Answer any Five questions.*
- 2) *All questions carry equal marks.*

Q1) a) Write the code for 4:1 MUX using dataflow & behavioral modelling. **[4]**

b) Implement the following using PLA

$$F_1(A, B, C) = \sum_m(4, 5, 7)$$

$$F_2(A, B, C) = \sum_m(3, 5, 7) \quad \mathbf{[3]}$$

c) State with syntax any three loop structures in verilog. **[3]**

Q2) a) Write a verilog code for decimal to BCD encodes using **[4]**

i) If else statement.

ii) Case statement.

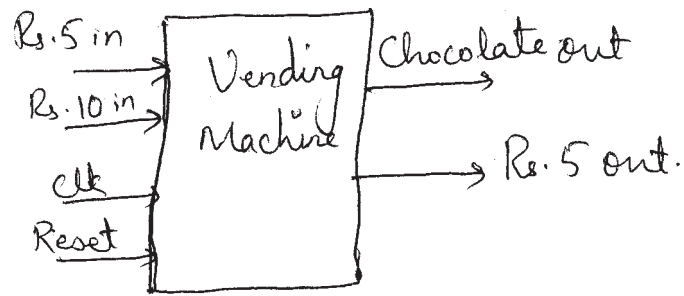
b) Write a verilog code for 4-bit up-down counter using behavioral modelling. **[3]**

c) Draw a basic DRAM memory cell what are the control input signals required for it? How many address lines will be needed for 4096 x 8 bit DRAM. **[3]**

P.T.O.

- Q3)** a) State the difference between task & function in verilog write a function to multiply two 4-bit numbers a & b. The output is a eight bit value. [4]
- b) Draw & explain the architecture of CPLD. [3]
- c) Design & explain eight bit magnitude comparator using 4-bit magnitude comparator IC 7485. [3]
- Q4)** a) Design synchronous counter for the sequence 4-6-7-3-1-4 using T-flip flops. [4]
- b) Draw & explain circuit diagram for 4-bit parallel adder using full adders. Explain how you can obtain overflow bit in the circuit. [3]
- c) State the advantages of PLD's over fixed function IC's list various types of PLD's. [3]
- Q5)** a) Write verilog code using FSM for stepper motor sequence generation with bidirectional control. [4]
- b) Minimize the following expression using k-maps & realise using logic gates
- $$y = \sum_m(1, 4, 6, 8, 10, 12, 15) \quad [3]$$
- c) State with examples any six operator types in verilog. [3]
- Q6)** a) Write verilog module "addition" along with task "sum" in the same module which computes sum of two eight bit numbers A, B & returns the sum as well as carry if any. [4]
- b) Explain with example [3]
- i) Delay based timing control,
- ii) Event based timing control &
- iii) Level sensitive timing control in behavioral modelling of verilog.
- c) Using k-map obtain logical expression for 'segment d' of BCD to seven segment decoder to drive common cathode display. [3]

- Q7) a)** Draw & explain architecture of FPGA. Also explain its features. [5]
- b) Design a simple digital circuit using FSM in verilog for a chocolate vending machine with following constraints [5]
- Assume that the chocolate cost's Rs. 15.
 - The coin acceptor machine accepts Rs. 10 & Rs. 5 coins.
 - If user inserts two coins of Rs. 10, then Rs. 5 coin is given back.



Draw state diagram & write the verilog code.

- Q8) a)** Draw circuit diagram for MOS - static RAM cell using transistors. Explain how data is stored in it & comment on “DRAM needs refreshing”. [5]
- b) Draw circuit diagram for 2-digit multiplexed display. Write the verilog code for two digit BCD counter with output on multiplexed display. [5]



Total No. of Questions : 6]

SEAT No. :

P2686

[Total No. of Pages : 2

[5034]-104

M.Sc. - I

ELECTRONIC SCIENCE

EL1UT04 : Advanced 'C' Programming

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

Time : 2½ 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) State the various memory allocation functions with their task. **[4]**
- b) Explain union in 'C' with suitable example. **[3]**
- c) Discuss the scope and lifetime of variables. **[3]**

Q2) Answer the following:

- a) Write a 'C' - program to convert decimal number to binary number. **[4]**
- b) Explain following functions with suitable example **[3]**
 - i) fgetc ()
 - ii) rewind
- c) Give comparison between recursion and iteration. **[3]**

Q3) Answer the following:

- a) What is polymorphism? State and explain various types of polymorphism. **[4]**
- b) Explain the various types of storage class. **[3]**
- c) A 7-segment display is interfaced to PC through a 7447 IC. Write a c program that will cause the display to show counting up and down. **[3]**

P.T.O.

Q4) Answer the following:

- a) Write a c program to concatenate two strings. [4]
- b) Explain the concept of inheritance with its different types. [3]
- c) Give the difference between ‘call by value’ and ‘call by reference’. Illustrate it with the help of suitable C program. [3]

Q5) Answer the following:

- a) Write a program to create a file which contains ten integer numbers, and then reads all numbers of this file and seperately writes odd and even numbers to another files ‘odd.dat’ & ‘even.dat’ respectively. [5]
- b) Write a program in C to draw sine wave using graphics.h file. [5]

Q6) Answer the following:

- a) Write a C program using pointers to compute the sum of all elements in one dimensional array. [5]
- b) Write a short note on ‘video adapter and video graphics modes’. [5]



Total No. of Questions : 8]

SEAT No. :

P2687

[Total No. of Pages : 3

[5034]-201

M.Sc.

ELECTRONIC SCIENCE

**EL2 UT05 : Applied Electromagnetics, Microwaves and Antennas
(2013 Pattern) (Semester-II) (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) *Draw neat diagrams wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) Attempt the following questions:

- a) Given the expression for propagation constant γ (gamma) for electromagnetic waves in a dielectric medium as
$$\gamma = \alpha + j\beta = \sqrt{j\omega\mu(\sigma + j\omega\epsilon)}$$
, obtain the expressions for α and β . **[4]**
- b) A 300m long transmission line has $R = 4k\Omega$, $L = 0.15$ mH, $G = \text{mm hos}$ and $C = 12$ nF. It is operated at 6 MHz. Find the propagation constant. **[3]**
- c) Explain the different methods of impedance matching on a transmission line. **[3]**

Q2) Answer the following questions:

- a) Starting with the current and voltage waves travelling along a transmission line, obtain the expression for reflection coefficient. **[4]**
- b) The electric field intensity of a wave travelling in a perfect dielectric with $\mu = \mu_0$ is given by $\vec{E} = 10\cos(6\pi \times 10^7 t - 0.4\pi z) \hat{i}$ V/m. Find the phase velocity and relative permittivity of the dielectric. **[3]**
- c) What is the procedure for determining characteristic impedance and propagation constant of a given transmission line. **[3]**

P.T.O.

Q3) Attempt the following questions:

- a) What are the different types of transmission lines? [4]
- b) Find the group velocity of an electromagnetic wave travelling in a rectangular waveguide of dimensions $4.75 \text{ cm} \times 3 \text{ cm}$ with a frequency of 6 GHz. Assume $C = 3 \times 10^{10} \text{ cm/s}$. [3]
- c) Calculate the cutoff frequency for the TE_{01} and TE_{11} modes in a rectangular metal waveguide of dimensions $2 \text{ cm} \times 1 \text{ cm}$. [3]

Q4) Attempt the following questions:

- a) With suitable diagrams explain the construction and working of a magnetron. [4]
- b) Sea water has $\sigma = 5 \text{ mho/m}$, $\epsilon_r = 80$, $\mu = \mu_0$. Find the distance upto which an electromagnetic wave attenuates to 10% of its original value at 25 kHz. [3]
- c) A cubical cavity resonator made of copper ($\sigma = 5.8 \times 10^7 \text{ mho/m}$) is to be operated at 15 GHz. Find the dimensions of the cavity. [3]

Q5) Attempt the following questions:

- a) Starting with Maxwell's equations obtain the wave equations for electromagnetic waves in free space. [4]
- b) How can the field pattern of an antenna be measured? [3]
- c) Find the effective area of a half wave dipole antenna operating at 500 MHz. Given the directivity $D = 1.65$. [3]

Q6) Attempt the following questions:

- a) From Maxwell's equations obtain the expression for Poynting theorem and explain the terms in it. [4]
- b) What are waveguide components? Enlist at least 4 components. [3]
- c) A lossless transmission line has characteristic impedance of 50Ω and load resistance of 60Ω . What is its input impedance? [3]

Q7) Attempt the following questions:

- a) What are the important features of a horn antenna? Why is it called a supergain antenna? Explain its construction with suitable diagrams. [5]
- b) The characteristic impedance of a transmission line is $50 + j 10\Omega$, it is terminated in a load of $75 + j 0.05 \Omega$. Find the reflection coefficient and SWR. [5]

Q8) Attempt the following questions:

- a) Consider an isotropic source of electromagnetic waves with 250W power. Calculate the electric field at 1.8m distance from the centre of the source. [5]
- b) The terminal current of a transmitting antenna is 4A. Calculate the power radiated and radiation resistance if $E = 60 \text{ mV/m}$ at a distance of 1000m. Assume $Z_0 = 377 \Omega$. [5]



Total No. of Questions : 8]

SEAT No. :

P2688

[Total No. of Pages : 4

[5034]-202

M.Sc.

ELECTRONIC SCIENCE

EL2 UT06 : Instrumentation and Measurement Techniques

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) What is significance of measurement? Classify instruments and compare deflection type and null type instruments. **[4]**

b) List the static characteristic parameters of measurement system. Explain Accuracy, Precision and Noise. **[3]**

c) What is static sensitivity of measurement system? A Wheatstone Bridge requires a change of 7Ω in the unknown arm of the bridge to produce a change in deflection of 3 mm of the galvanometer. Determine the sensitivity and deflection factor. **[3]**

Q2) a) What is loading effect? Explain the importance of input and output impedance of measurement system. Describe loading effect due to series connected instrument. **[4]**

b) Describe step response of first order instruments. **[3]**

c) What is error? State types of errors involved in measurement. A wattmeter having range of 1000 W has an error of $\pm 1\%$ of FSD. If the true value of power is 100 W. What would be the range of reading? If the error is specified as percentage of true value, what would be the range of reading? **[3]**

P.T.O.

Q3) a) Describe the properties of piezoelectric materials. Draw equivalent circuit of piezo-electric transducer. Write the equation of charge and output voltage. List the applications of piezo electric transducer. [4]

b) Explain the various factors influencing the choice of transducer for measurement of physical parameter. [3]

c) State dynamic characteristic parameters of measurement system.

A linear second order system with single degree of freedom has a mass of 8×10^{-3} kg and stiffness of 1000 Nm. Calculate the natural frequency of the system. Determine the damping constant necessary to prevent overshoot in response to a step input of force. [3]

Q4) a) Describe the response of second order system. Explain the three conditions of the response for a unit step input. [4]

b) A resistance is determined by voltmeter-Ammeter method. The voltmeter reads 100 V with a probable error of ± 12 V and the ammeter reads 10 A with probable error of ± 2 A. Determine the probable error in the computed value of resistance. [3]

c) With block diagram explain the generalised measurement system. [3]

Q5) a) List the types of transducers used for- [4]

i) Displacement measurement

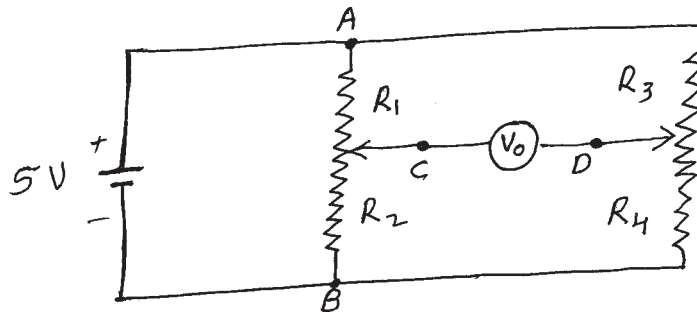
ii) Force measurement

iii) Pressure measurement and

iv) Acceleration measurement

b) As shown in fig. 1 a resistance potential divider $R_1 R_2$ with resistance of $5 \text{ K}\Omega$ and a shaft stroke of 125 mm is used in the arrangement. A potentiometer $R_3 R_4$ has a resistance of $5 \text{ k}\Omega$ and the input voltage is 5V. The initial position is used as a reference point in such a case $R_1 = R_2$. At the start of the test potentiometer $R_3 R_4$ is adjusted so that the bridge is balanced, the bridge output is 0V. The displacement being measured will move a maximum distance of 12.5 mm towards point A. Calculate the value of output voltage. [3]

Fig. 1.



- c) A strain gauge is bonded to a beam of 0.1m long and has cross sectional area of 4 cm^2 . Young's modulus of steel is 207 GN/m^2 . The unstrain resistance of strain gauge is 240Ω and gauge factor of 2.2. When load is applied the change in resistance of the gauge by 0.013Ω . Calculate the change in length of steel beam and the amount of force applied to the beam. [3]

Q6) a) Describe thermistor temperature transducer. State advantages of it. List the applications of thermistor. [4]

- b) What is RTD?

A platinum thermometer has a resistance of 100Ω at 25°C . Find its resistance at 60°C . Platinum has a resistance temperature coefficient of $0.00392/^\circ\text{C}$. If the thermometer has resistance of 150Ω . Calculate the temperature. [3]

- c) What is LVDT? State advantages of LVDT. The output voltage of LVDT is 2.5 V at the maximum displacement. At a load of $500 \text{ k}\Omega$, the deviation from linearity is maximum and it is $\pm 0.003 \text{ V}$ from a straight line through origin. Find the linearity at given load. [3]

Q7) a) What is thermocouple? Why reference junction is required? Explain reference junction compensation in thermocouple temperature measurement.

A Chromel-alumel thermocouple with output of 33.3V when measuring a temperature of 800°C with reference junction at 0°C. The resistance of meter coil R_m is 50Ω and current of 0.1 mA gives full scale deflection. The resistance of the junction and lead R_e is 12Ω. Calculate: [5]

- i) Value of series resistance at 800°C to give FSD.
 - ii) The approximate error due to rise of 1Ω in R_e .
- b) Describe working principle of capacitive transducer. State applications of capacitive transducer. A parallel plate capacitor used in force measurement with area of plate is 500 mm² and distance of 0.2mm. Calculate the value of capacitance with air dielectric having permittivity of 8.85×10^{-12} F/m. Calculate the change in capacitance if a linear displacement reduces the distance between the plates to 0.18 mm also calculate ratio of per unit change of capacitance to per unit change in displacement. [5]

Q8) a) List velocity measurement transducers. Give working principle of stroboscope.

A speed of shaft rotating at 2880 rpm is measured using a stroboscope. The stroboscope dial is slowly turned from setting of 4320 rpm to 1400 rpm corresponding to flash rate at 96 to 24 per second. Indicate the speed setting which gives single, double and triple steady images. What is the observation when the flashing rate is 50 per second? [5]

b) List the different methods of flow measurement. Give working principle of [5]

- i) Electromagnetic flowmeter.
- ii) Ultrasonic flowmeter.



Total No. of Questions : 8]

SEAT No. :

P2689

[Total No. of Pages : 4

[5034]-203

M.Sc.-I

ELECTRONIC SCIENCE

EL2 UT07 : Embedded System Design

(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) *Figures to the indicate full marks.*
- 4) *Draw neat diagram wherever necessary.*
- 5) *Use of non-programmable calculator is allowed.*

Q1) Attempt the following:

- a) Write C program for AVR to generate non-inverted PWM output of frequency 31.250 kHz and 75% duty cycle on pin PORTB.3. Use FAST PWM mode of TIMERO. **[4]**

Given XTAL = 8MHz

TCCRO:

7	6	5	4	3	2	1	0
FOC0	WGM00	COM01	COM00	WGM01	CS02	CS01	CS00

- b) List different SFRS associated with PORTS of PIC18 F4550 microcontroller.

Write C program for PIC microcontroller to get byte of data from PORTC and if it is less than 100, send it to PORTB other wise send it to PORTD. **[3]**

- c) With suitable diagram compare Von Neumann and Harvard architecture. **[3]**

P.T.O.

Q2) Attempt the following:

- a) Find the value for T0CON to program Timer 0 of PIC18 microcontroller as 16-bit timer with no prescaler. **[4]**

Write no prescaler.

Write function to generate delay of 100 μ s.

Use: timer 0 in 16-bit mode.

T0CON:

7	6	5	4	3	2	1	0
TMROON	TO8BIT	TOCS	TOSE	PSA	TOPS2	TOPS1	TOPS0

INTCON:

7	6	5	4	3	2	1	0
GIE	PEIE	TMROIE	INTOIE	RBIE	TMROIF	INTOIF	RBIF

- b) List serial communication peripheral systems in Atmega 16 microcontroller. Explain any one in short. **[3]**
- c) Explain development cycle of Embedded system. **[3]**

Q3) Attempt the following:

- a) Explain stack and stack pointer in PIC 18f 4550 microcontroller. **[4]**
- b) What is zigbee protocol? State its specifications. **[3]**
- c) Compare RISC and CISC architecture. **[3]**

Q4) Attempt the following:

- a) List the features of on chip ADC of Atmega 16 microcontroller. Write C program to read ADC and display most significant 8-bits of data read on PORTD. **[4]**

ADMUX:

7	6	5	4	3	2	1	0
REFS1	REFS0	ADLAR	MUX4	MUX3	MUX2	MUX1	MUX0

ADCSRA:

7	6	5	4	3	2	1	0
ADEN	ADSC	ADATE	ADIF	ADIE	ADPS2	ADPS1	ADPS0

- b) Draw and explain address map of data memory of PIC 18F 4550 microcontroller. [3]
- c) Explain software development tools used in embedded system development. [3]

Q5) Attempt the following:

- a) Write C program for PIC 18F 4550 microcontroller to generate PWM output of 10kHz with 50% duty cycle. Show calculations for PR2 and CCP1L value. [4]

Use $F_{osc} = 8 \text{ MHz}$

CCP1CON:

7	6	5	4	3	2	1	0
-	-	DC1B1	DC1B0	CCP1M3	CCP1M2	CCP1M1	CCP1M0

T2CON:

7	6	5	4	3	2	1	0
-	T2OUTPS3	T2OUTPS2	T2OUTPS1	T2OUTPS0	TM20N	T2CKPS1	T2CKPS0

- b) Write a note on CAN protocol. [3]
- c) Write ALP for Atmega 16, to copy 10 bytes of data memory from 60h-69h to 70h-79h. [3]

Q6) Attempt the following:

- a) Draw interfacing diagram of 16×2 LCD to Atmega 16 microcontroller. Write C program to display 2-digit BCD counter on LCD. [4]
- b) What is embedded system? List features of embedded system. [3]
- c) Draw interfacing of 8-bit DAC 0808 to PORTB of PIC microcontroller. Write C program to generate squarewave of amplitude 3V and 60% duty cycle.

Given $V_{ref} = 5V$. [3]

Q7) Attempt the following:

- a) Explain with neat diagram frame format of I2C protocol. Draw timing diagram for I2C write operation. [5]
- b) List sources of interrupt in Atmega 16. Write C program, using timer0, that toggles PORTB.5 every 40 microsecond while at same time transferring data from PORTC to PORTD. [5]

Q8) Attempt the following:

- a) Draw interfacing of stepper motor and two switches to PIC18F4550 microcontroller. Write C program to monitor the switches and do the action as per given table. [5]

SW1	SW0	Action
0	0	Stop motor
0	1	Rotate motor clockwise continuously
1	0	Rotate motor anticlockwise continuously
1	1	Stop motor

- b) Explain and compare RS232 and RS485. [5]



Total No. of Questions : 6]

SEAT No. :

P2690

[Total No. of Pages : 3

[5034]-204

M.Sc.-I

ELECTRONIC SCIENCE

EL2 UT08 : Foundations 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 side indicate full marks.*

Q1) a) Draw band diagram for **[4]**

i) Intrinsic

ii) n-type and

iii) p-type semiconductor at thermal equilibrium. Show that the product of electron and hole concentration is given by $n_0 \times p_0 = n_i^2$.

b) Assuming schrodinger's time independent wave function, obtain wavefunction for a particle in a one dimensional potential well of infinite depth. **[3]**

c) Explain the switching characteristic of PN junction diode. **[3]**

Q2) a) Define packing fraction in cubic lattice. Show that packing fraction of FCC and SC structures are 0.74 and 0.52 respectively. **[4]**

b) State the statistical laws used for explaining behavior of particles. Distinguish classical and quantum statistics. **[3]**

c) Define the following performance parameters of BJT **[3]**

i) dc common-base current gain.

ii) The emitter injection efficiency factor γ .

iii) The base transport factor α_T .

P.T.O.

- Q3)** a) Obtain expression for electron diffusion current density and hole current density in semiconductor. Show graphically the electron and hole concentration variation as a function of distance. [4]
- b) Explain hybrid pi-equivalent circuit in BJT. [3]
- c) Calculate de-Broglie wavelength for an electron with kinetic energy of [3]
- i) 1eV
 - ii) 100 eV and
 - iii) Body of mass 200 kg travelling at 20 m/s.

Compare results obtained and comment.

- Q4)** a) A silicon Hall device at 300°K has the following geometry: $d = 10^{-3}$ cm, $W = 10^{-2}$ cm and $L = 10^{-1}$ cm. The experimental parameter measured are $I_x = 0.75$ mA, $V_x = 15$ V. $V_H = +5.8$ mV and $B_z = 10^{-1}$ tesla. Determine [4]
- i) Type of conductivity,
 - ii) Majority carrier concentration.
- b) Explain concept of effective mass. Show that in semiconductor material mass of electron is positive in E-K space. [3]
- c) Classify the crystalline solids. Explain term lattice and primitive vector in 2D. [3]

- Q5)** a) Explain Eber-moll model for BJT with equivalent circuit diagram. [5]
- b) Explain the following terms: [5]
- i) Mobility
 - ii) Drift current
 - iii) Conductivity
 - iv) Diffussion current
 - v) Total drift current density

Q6) a) Discuss constructional difference of HBT from BJT. What are special features of HBT? [5]

b) Explain Fermi-Dirac distribution function at absolute zero and at higher temperature assuming material obeys FD distribution, the Fermi-energy level for a particular material is 6.25 eV. Calculate temperature at which there is 1% probability that a state is 0.30 eV below Fermi-energy level will not contain an electron.

Given $K = 8.62 \times 10^{-5} \text{ eV/K}$ $e = 1.6 \times 10^{-19} \text{ C}$. [5]



Total No. of Questions : 8]

SEAT No. :

P2691

[Total No. of Pages : 3

[5034]-301

M.Sc.

ELECTRONIC SCIENCE

EL3 UT-09 : Communication Electronics

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

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

Q1) a) Draw the block diagram of delta modulator and explain its working. **[4]**

b) Describe atmospheric and space noise in short. **[3]**

c) Write the difference between resonant and non resonant antennas. **[3]**

Q2) a) With the help of block diagram explain the working of infrared data association (IrDA) module. **[4]**

b) For amplitude modulation (AM), show that the power contained in the sidebands is one third of the total power. **[3]**

c) Explain the terms information and information theory in short. Which are the aims of the information theory. **[3]**

Q3) a) What is an antenna coupler? Describe the functions of it. **[4]**

b) Describe the ISDN address structure in short. **[3]**

c) With the help of neat diagram, explain the working of balanced modulator using diode/FET for DSBSC generation. **[3]**

P.T.O.

- Q4)** a) Describe XMODEM protocol and write the importance of it. [4]
b) Write the advantages and disadvantages of smart antenna's. [3]
c) Explain any two types of connectors used for fiber optic communication. [3]
- Q5)** a) Draw the circuit diagram of transistor RF amplifier. Explain its working in short. Write the advantages of RF amplifier. [4]
b) With the help of block diagram, explain the working of Frequency Shift Keying (FSK) transmitter in short. [3]
c) Describe sky-wave propagation of electromagnetic waves. [3]
- Q6)** a) What is 3G? Explain the 3G standards. Write the advantages and disadvantages of 3G. [4]
b) With the help of diagram, explain the working of varactor diode modulator. [3]
c) With the help of block diagram, explain the working of pulse code modulation in short. [3]
- Q7)** a) With the help of neat diagram, describe broad side array antenna and its radiation pattern. [4]
b) Draw the block diagram of fiber optic communication link and explain it in short. [3]
c) Write the phase modulated wave equation for a 25 MHz carrier is modulated by a 400 Hz audio sine wave. If the carrier voltage is 4V and the maximum deviation is 10 kHz. [3]

- Q8)** a) With the help of neat diagram, explain the working of frequency division multiplexing (FDM) in short. **[4]**
- b) Draw the geometry of cassegrain fed paraboloid reflector antenna and explain its working in short. **[3]**
- c) Describe any two applications of geostationary satellite in short. **[3]**



Total No. of Questions : 8]

SEAT No. :

P2692

[Total No. of Pages : 2

[5034]-401

M.Sc.-II

ELECTRONIC SCIENCE

EL4 UT10 : Control Systems

(2013 Pattern) (Semester-IV) (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) *Use of non programmable calculator is allowed.*
- 5) *Neat diagrams must be drawn wherever necessary.*

Q1) a) Draw a block diagram of closed 100 P control system and explain in short. **[4]**

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

c) List the requirements of ideal control system. **[3]**

Q2) a) Derive the transfer function of simple or canonical control system. **[4]**

b) Determine the number of right-hand plane poles in the closed loop transfer

function $T(s) = \frac{10}{s^5 + 7s^4 + 6s^3 + 42s^2 + 8s + 56}$. **[3]**

c) Define magnitude and phase plot of Bode plot. **[3]**

Q3) a) Explain the action of three position mode of discontinuous process control. **[4]**

b) With the help of appropriate diagram explain the 'offset' in proportional control. **[3]**

c) Give the controller selection criteria for a given process. **[3]**

P.T.O.

- Q4)** a) What is meant by alarm annunciator? Explain the basic concept. [4]
 b) Write a short note on pneumatic control valve. [3]
 c) Which types of standard graphic symbols are used for process control and instrumentation. [3]
- Q5)** a) Consider unity gain feedback system with $G(s) = \frac{K}{s}$. Obtain its root locus. [4]
 b) List the advantages of frequency domain approach for control system analysis. [3]
 c) What are the advantages of Nyquist plot. [3]
- Q6)** a) Define and explain the following terms [4]
 i) Error,
 ii) Dead time.
 b) A PI controller is reverse acting with proportional band = 20 and 12 repeats per minute. Find proportional gain and integral gain. [3]
 c) List the advantages of distributed control systems. [3]
- Q7)** a) Explain critical rules for block diagram reduction. [5]
 b) How process loop tuning is done using open loop transient response method for PI control. [5]
- Q8)** a) Sketch the outputs of PI, PD and PID controllers for step input. [5]
 b) With the help of neat diagram explain the temperature control system. [5]

