

Total No. of Questions : 8]

SEAT No. :

P1774

[5231]-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) *Use of non-programmable calculator is allowed.*

Q1) Attempt the following:

- a) Which mathematical methods of modeling are used in electronic science applications? List some applications. **[4]**
- b) Explain degree, order and linearity of differential equation with suitable example. **[3]**
- c) Transfer function of a system is given by

$$T(S) = \frac{S+5}{S(S+3)(S+4)(S^2+7S+12)}$$

Find poles and zeroes. Sketch its pole-zero plot. **[3]**

Q2) Attempt the following:

- a) The co-ordinates of point p in Cartesian co-ordinates system are (3, 4, 12). Determine co-ordinates in cylindrical and spherical co-ordinates system. **[4]**
- b) Define 2 transform. Explain any three properties of 2 transform. **[3]**
- c) State and prove maximum power transfer theorem for dc circuit. **[3]**

P.T.O.

Q3) Attempt the following:

- a) Test the following polynomial is Hurwitz polynomial or not

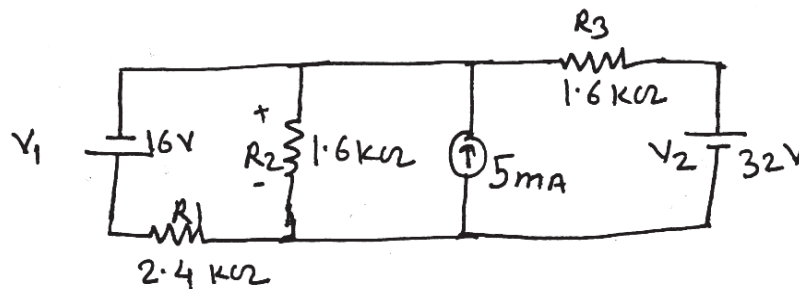
$$F(S) = S^4 + S^3 + 5S^2 + 3S + 4. \quad [4]$$

- b) Convert π network to T network for given $R_A = 15\Omega$, $R_B = 10\Omega$ and $R_C = 25\Omega$. [3]

- c) Determine the unit step response to the series R-L circuit using differential equation. [3]

Q4) Attempt the following:

- a) Determine the voltage drop across resistor R_2 using superposition theorem. [4]



- b) Draw circuit diagram of op-amp first order Butterworth high pass filter. Determine its transfer function in S domain. [3]

- c) What are the different types of differential equations? Classify and give examples of each. [3]

Q5) Attempt the following:

- a) Write Bessel differential equation. List any four applications of Bessel equation in physics and Electronics. [4]

- b) State initial value theorem. Using this theorem determine the initial value of $f(t) = e^{-2t} \cos 10t$. [3]

- c) Explain the terms; graph, tree and node of network. [3]

Q6) Attempt the following:

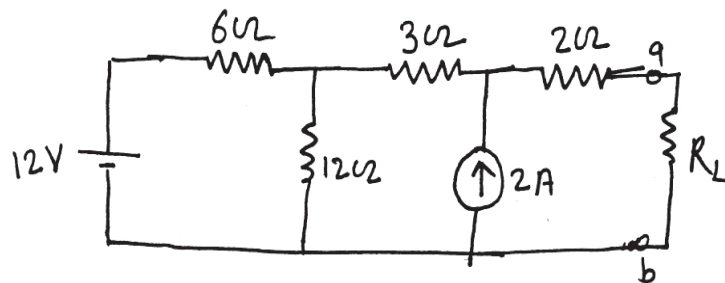
- What is meant by state variables? Apply the state variable approach to series LCR circuit with the excitation of unit step function. [4]
- In parallel RLC circuit, there is no initial charge on capacitor. If switch is closed at $t = 0$, find the resulting voltage. Given $R=0.2\Omega, L=\frac{1}{6}H, C=1F$ and driven current is $4e^{-t}$ Amp. [3]
- Write short note on two port network. [3]

Q7) Attempt the following:

- What is meant by modeling? State different types of mathematical modeling. Explain mechanical physical quantities can be analogous to electrical quantities. [5]
- Write a wave equation in cylindrical co-ordinate system separate the variables. [5]

Q8) Attempt the following:

- State convolution theorem. Using convolution theorem, determine the inverse Laplace transform of $F(S)=\frac{S}{(S^2+a^2)^2}$. [5]
- Explain Thevenin theorem. Use the thevenin equivalent of the network shown in following diagram to find the value of Thevenin resistance which will receive maximum power. Find also this power. [5]



Total No. of Questions :8]

SEAT No. :

P1775

[Total No. of Pages :3

[5231] - 102

M.Sc. - I

ELECTRONIC SCIENCE

EL1-UT02: Analogue Circuit Design

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

Time : 3 Hours]

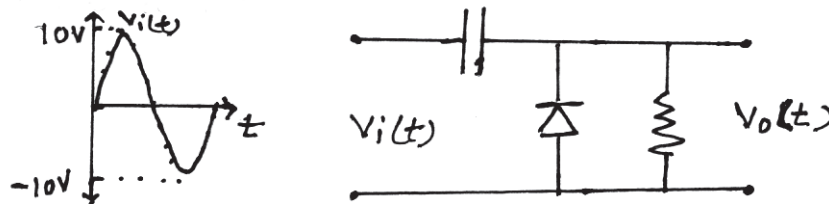
[Max. Marks :50

Instructions to the candidates:

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

Q1) Attempt the following :

- a) Explain the terms static resistance and dynamic resistance of diode. [4]
- b) Compare JFET and MOSFET. [3]
- c) Identify the circuit drawn below and determine the output if a sinusoidal input of 10v peak to peak is applied to it. [3]



Q2) Attempt the following :

- a) Draw the a.c. equivalent of CE amplifier with fixed bias using h. parameter model and derive the equation for input impedance, output impedance and current gain. [4]
- b) With the circuit diagram, explain different coupling schemes used in BJT amplifier. [3]
- c) Design a 1st order low pass filter for pass band voltage gain 2 and cut-off frequency $F_c = 1\text{KHz}$ using OPAMP. [3]

P.T.O.

Q3) Attempt the following :

- a) Draw the equivalent circuit of a quartz crystal. Explain with circuit diagram colpitts crystal oscillator. [4]
- b) Distinguish between single tune and stagger - tuned amplifier. [3]
- c) In the Hartley oscillator, $L_2 = 0.4\text{mH}$ and $C = 0.004\mu\text{F}$. If the frequency of the oscillator is 120 KHz, Find the value of L_1 . Neglect mutual inductance. [3]

Q4) Attempt the following :

- a) What is MOSFET? With the help of suitable diagram, explain the working of the depletion and enhancement mode of operation of MOSFET. [4]
- b) Explain the different types of distortion in amplifier. [3]
- c) Draw the circuit diagram of practical differentiators using OPAMP and give its designing steps. [3]

Q5) Attempt the following :

- a) For a single stage RC coupled BJT amplifier circuit, if $V_{cc} = 12\text{V}$, $I_c = 4\text{mA}$, $h_{fe} = 100$, $h_{ie} = 1\text{ k}\Omega$, $R_L = 120\text{ K}\Omega$ and $F_L = 100\text{ Hz}$ then determine R_1 , R_2 , R_C and R_E . [4]
- b) Draw a fixed bias circuit of transistor and derive an expression for its stability Factor. State advantages of this biasing. [3]
- c) In the colpitts oscillator, $c_1 = 0.2\mu\text{F}$ and $c_2 = 0.022\mu\text{F}$. If Frequency of oscillator is 9KHz, Find value of inductor. Also find required gain for oscillation. [3]

Q6) Attempt the following :

- a) What is clipper? With the help of circuit diagram and waveform describe the operation of positive and negative externally biased shunt type clipper circuit. **[4]**
- b) Design a practical integrator circuit to integrate a square wave of Frequency 10 KHz. The dc gain of integrator should be adjusted to 12. **[3]**
- c) Draw the circuit diagram of RC phase shift oscillator using BJT. If $R_1 = R_2 = R_3 = 150\text{k}\Omega$ and $C_1 = C_2 = C_3 = 150\text{ pF}$, Find the Frequency of oscillations. **[3]**

Q7) Attempt the Following :

- a) Draw the block diagram of the PLL and explain the function of each block. State its applications. **[5]**
- b) Define Q factor of resonant circuit. Derive equation for Q factor of RL and RC circuit. **[5]**

Q8) Attempt the following :

- a) Draw the circuit diagram of instrumentation amplifier using 3 - OPAMPS and explain it. Obtain the expression for its output voltage. **[5]**
- b) Draw the equivalent circuit of RC coupled in the mid - frequency range, high frequency range and Low frequency range. Derive the equation for current gain in mid - frequency range. **[5]**



Total No. of Questions :8]

SEAT No. :

P1776

[Total No. of Pages : 2

[5231] - 103

M.Sc. -I

ELECTRONIC SCIENCE

ELIUT- 03: Digital System Design

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

Time : 3 Hours]

[Max. Marks :50

Instructions to the candidates:

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

Q1) a) Draw the typical design flow for designing a digital circuit using verilog. [4]

b) Design BCD to Gray code converter. [3]

c) What is LUT? Draw diagram of 4 - input LUT with registered and an unregistered outputs. [3]

Q2) a) What is test bench? Write verilog code for full adder and write test bench to test this code. [4]

b) What is look ahead carry in parallel adder? How it speeds up the addition? [3]

c) Implement the following using PLA. [3]

$$A(x, y, z) = \sum m(1, 2, 4, 6)$$

$$B(x, y, z) = \sum m(0, 1, 6, 7)$$

Q3) a) What is regular and intra-assignment delay? What is difference belowing following assignments? [4]

$$\# 10 \ q = x + y;$$

$$q = \# 10 \ x + y;$$

b) Explain with circuit diagram BCD adder using 4 - bit parallel adder. [3]

c) Draw circuit diagram of 4-bit Johnson counter. Draw timing diagram of Johnson counter. [3]

P.T.O.

- Q4)** a) Write verilog code for 2 to 4 decoder using behavioural modeling. [4]
 b) Explain the term excitation table. Write excitation table for J K and D flip-flop. [3]
 c) Explain with neat diagram, write operation of DRAM cell. [3]
- Q5)** a) Write verilog code for 4 - bit up-down counter using behavioural modeling. [4]
 b) Draw architecture of CPLD. How CPLD differs from FPGA. [3]
 c) Draw circuit diagram of 1 to 4 demultiplexer. Explain how it can be used as 2 to 4 decoder. [3]
- Q6)** a) Write the comparison between blocking and non-blocking assignment statements. [4]
 b) Minimize the following expression using K-map and realize using basic gates. [3]

$$y = \Sigma m (0, 1, 2, 5, 13, 15)$$

 c) Give detail account of types of ROM. Explain how data is stored in EPROM. [3]
- Q7)** a) Write verilog module for full subtractor. Write verilog code using structural modeling for 3 - bit full subtractor using this module. [5]
 b) Design sequence generator to generate a sequence 0 - 1 - 7 - 4 - 2 - 0 using T flip - flops. [5]
- Q8)** a) Write verilog code for JK flip-flop using behavioural modeling. [5]
 b) Draw schematic of SRAM cell. Write comparison between SRAM and DRAM. [5]

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Total No. of Questions :6]

SEAT No. :

P1777

[5231]-104

[Total No. of Pages : 2

M.Sc. - I

ELECTRONIC SCIENCE

**EL1UT - 04 : Advanced 'C' Programming
(2013 Pattern) (Credit System) (Semester - I)**

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 indicate full marks.*

Q1) Answer the following.

- a) Write a C-program to convert given decimal number to hexadecimal number. **[4]**
- b) What is unary operator? State its types. **[3]**
- c) Explain with example the scanf () and printf () functions. **[3]**

Q2) Answer the following.

- a) Write a C-Program to draw the symbol of NOT gate using graphics functions. **[4]**
- b) Explain in short the storage classes available in C. **[3]**
- c) Discuss the concept of object and class in C++. **[3]**

Q3) Answer the following.

- a) Write a C program to find equivalent resistance of parallel combination of n resistors. **[4]**
- b) Explain with suitable example the types of literals in C++. **[3]**
- c) What are the bit-wise logical operators? Give suitable example. **[3]**

P.T.O.

Q4) Answer the following.

- a) Write a C-Program to find sum of Fibonacci series upto 8th term using recursive function. [4]
- b) Explain the functions available in C to handle the parallel port. [3]
- c) Explain the following file handling functions. [3]
 - i) fgets ()
 - ii) fseek ()

Q5) Answer the following.

- a) Write a C-Program using structure that will read name, roll no. and marks in 3 subjects of 3 students and then display name and roll no. of student who scored more than 70% marks. [5]
- b) State various types of video adapters. Explain any one. [5]

Q6) Answer the following

- a) Write a C-Program using pointers to find the sum of all elements in one dimensional array. [5]
- b) Write a C-Program to create a file to store information about a person (name, age and salary) [5]



Total No. of Questions :8]

SEAT No. :

P1778

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[5231] - 201

M.Sc. - I

ELECTRONIC SCIENCE

**EL2UT05: 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) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non - programmable electronic calculators is allowed.*

Q1) Answer the following questions :

- a) Starting with Maxwell's equations, obtain electric wave equation and magnetic wave equation for a charge free, homogeneous, isotropic medium (free space). **[4]**
- b) State Poynting theorem. The electric field for a TEM wave is 100 V/m. Calculate the velocity and magnitude of Poynting vector for the wave in air. **[3]**
- c) Determine the phase velocity of a wave travelling in a perfect dielectric if the electric field intensity is **[3]**

$$\vec{E} = 20 \cos (10\pi \times 10^7 t - \pi z) \hat{i} \text{ V/m.}$$

What is the permittivity of the medium if $\mu = \mu_0$?

P.T.O.

Q2) Answer the following questions :

- a) Draw the schematic circuit of a transmission line, based on uniformly distributed circuit theory and obtain transmission line equations. [4]
- b) What is the procedure for determining the characteristic impedance and propagation constant of a given transmission line? [3]
- c) A transmission line has reflection coefficient of $0.4 \angle -42^\circ$. Find the standing wave ratio. [3]

Q3) Answer the following questions :

- a) Define the term 'cut - off frequency' of an electromagnetic wave - guide. On which factors does it depend? Write the expression for cut - off frequency for TE_{mn} modes. [4]
- b) Explain the terms group velocity and phase velocity of an electromagnetic wave travelling through a rectangular wave-guide of dimensions $a \text{ cm} \times a \text{ cm}$. Which of these two velocities can be greater than velocity of light? [3]
- c) Consider an isotropic source of light with 200 W power. Calculate the electric field at 1.5m from the centre of the source. [3]

Q4) Answer the following questions :

- a) With a neat diagram, explain the working of a reflex klystron. [4]
- b) Write a short note on end - fire antenna. [3]
- c) Establish Friis equation for a one way radio link. [3]

Q5) Answer the following questions :

- a) Find the radiation resistance of a Hertzian dipole with length $\lambda/10$. What is a Hertzian dipole? [4]
- b) What is meant by field pattern of an antenna? How is the field pattern determined? [3]
- c) With the necessary expressions, explain the concept of retarded potentials. [3]

Q6) Answer the following questions :

- a) Why is impedance matching necessary with transmission lines? Describe any two methods of impedance matching on transmission lines. [4]
- b) A rectangular waveguide with dimensions $a = 2.5$ cm and $b = 1$ cm, filled with a medium characterised by $\sigma = 0$, $\epsilon = 4\epsilon_0$ and $\mu_r = 1$ is operated at 15GHz. Calculate phase constant, phase velocity and wave impedance for TM_{11} mode. [3]
- c) What are cavity resonators? What is 'Q' of a cavity? How can it be determined? [3]

Q7) Answer the following questions :

- a) A plane wave $\vec{E} = 30 \cos(\omega t - z)\hat{a}_x$ V/m in air, is normally incident on the boundary of a lossless medium with $\mu = \mu_0$, $\epsilon = 4\epsilon_0$ at $z = 0$. Find the reflection coefficient and transmission coefficient. [5]
- b) A transmission line is 2m long and has a signal with frequency of $\omega = 10^6$ radians/s. $\alpha = 0.9$ Np/m, $\beta = 1$ rad/m and $Z_0 = 60 + j40 \Omega$. The line is connected to a 10V source with $Z_g = 40\Omega$ and terminated by a load of $20 + j50 \Omega$. Find the input impedance and sending - end current.

Hints : i) Find (γl)

ii) Determine $\tanh(\gamma l)$

iii)
$$Z_{in} = Z_0 \left[\frac{Z_L + Z_0 \tanh(\gamma l)}{Z_0 + Z_L \tanh(\gamma l)} \right]$$

iv) Sending end current is

$$= \frac{\text{sending end voltage}}{\text{sending end impedances}} \quad [5]$$

Q8) Answer the following questions :

- a) A distortionless line has characteristic impedance of 60Ω , attenuation constant of 20 m Np/m and wave velocity of $0.6c$, where c is velocity of light in vacuum. Find R , L , G , C and wavelength λ at 100 MHz . [5]
- b) Write a note on plane wave propagation through free space describing the wave components, critical frequency, reflection of plane waves, power density and attenuation of wave transmitted from a non - directional antenna. [5]



Total No. of Questions :8]

SEAT No. :

[Total No. of Pages :4

P1779

[5231] - 202

M.Sc.

ELECTRONIC SCIENCE

EL2UT - 06 : Instrumentation and Measurement Techniques

(2013 Pattern) (Semester - II)

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) Give detail classification of measurement systems. **[4]**

b) What is static calibration? Explain with suitable example. Write down the necessary steps to carry static calibration. **[3]**

c) Explain the following characteristic parameters of measurement system:

i) Threshold

ii) Scale readability and

iii) Resolution. **[3]**

Q2) a) Draw neat block diagram of measurement system and explain data presentation element of it. **[4]**

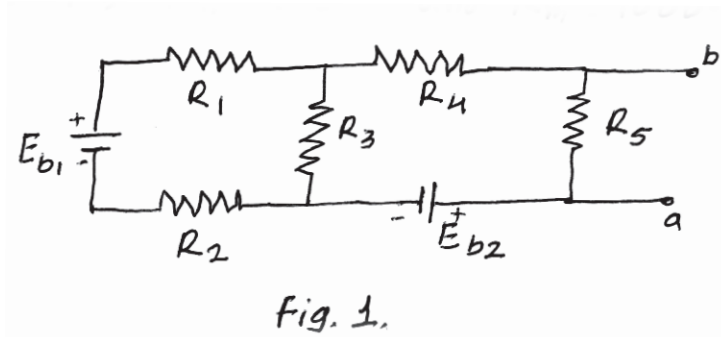
b) Explain static stiffness, input impedance and loading with suitable example. **[3]**

c) Describe step response of first order system with suitable example. **[3]**

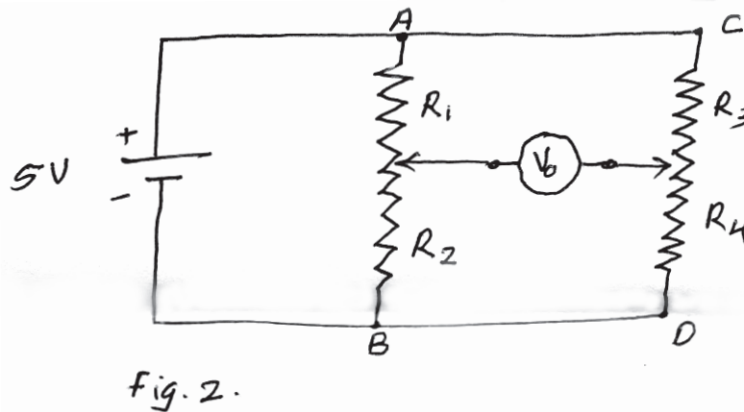
P.T.O.

Q3) a) Give detail classification of transducers. [4]

b) As shown in fig.1. what percentage error may be expected in measuring the voltage across R_5 . If $R_1 = R_2 = R_3 = R_4 = 100\Omega$ and $R_m = 1000\Omega$ and $R_m = 10k\Omega$. [3]



c) As shown in fig.2. A resistive potential divider R_1, R_2 with a resistance of 5000Ω and a shaft stroke of 125 mm is used. The potentiometer R_3, R_4 has a resistance of 5000Ω and $V_i = 5.0V$. The initial position is to be used as reference point such that $R_1 = R_2$, the wiper is at the mid point. The test potentiometer R_3, R_4 is adjusted so that the bridge is balanced and $V_0 = 0V$. The displacement being measured with mode a maximum distance of 12.5 mm to wards point A, Calculate the value of output voltage. [3]



Q4) a) Give the different methods used for velocity (Translational and Rotational) measurement. Explain stroboscopic method. [4]

b) Describe eddy current non contacting transducer. Give applications of it. [3]

- c) A temperature probe is transferred from air at 25°C to air at 35°C then to water at 70°C and back to air at 35°C. In each case the transfer is instantaneous. The effective time constant and the time sequence are -

In air, dry Probe $\tau = 30$ sec

In water $\tau = 5$ sec

In air, wet Probe $\tau = 20$ sec

For $t < 0$, $T = 25^\circ\text{C}$, Initial temperature.

$0 < t < 7$, $T = 35^\circ\text{C}$, dry probe in air.

$7 < t < 15$, $T = 70^\circ\text{C}$, Probe in water and

$15 < t < 30$, $T = 35^\circ\text{C}$, wet probe in air.

Calculate the temperature at the end of each time interval and sketch the indicated temperature - time relationship from $t = 0$ to $t = 30$ sec. [3]

- Q5) a)** A piezoelectric transducer has a capacitance of 1200 PF and charge sensitivity K_q of 100 PC/ μm . The connecting cable has a capacitance of 250 PF and the oscilloscope read out device has input impedance of 2 M Ω parallel with 75 PF capacitor.

- i) What is the sensitivity of the transducer alone? (mv/ μm).
- ii) What is the high frequency sensitivity of the entire system?
- iii) What is the lowest frequency that can be measured with 5 percent amplitude error by the entire system? [4]

- b) Give different methods of force measurement with associated transducer. [3]

- c) Describe piezoelectric transducer. Draw the equivalent circuit and list applications of it. [3]

- Q6)** a) List the gages used for low pressure (vacuum) measurement. A knudsen gage is to be designed to operate at a maximum pressure of $2 \mu\text{m}$ of mercury. For this application the spacing of the vane and plate is to be less than 0.3 mean free path at this pressure. Calculate the force on the vanes when the gas temperature is 27°C and the temperature difference is 40 K . [4]
- b) Give the different methods of pressure measurement. Write working principle of thermal conductivity gage. [3]
- c) A mild steel shaft is used to connect a motor drive to a constant load torque. To measure this torque, a resistance strain gauge of 120Ω resistance and gage factor of 2 is mounted at 45° to the shaft axis. shear modulus of elasticity is 80 GPa , shaft diameter is 50 mm and the change in gage resistance due to load is 0.1Ω . Find the load torque. [3]
- Q7)** a) List the flow measurement methods. Describe ultrasonic flow meter with proper diagram. [5]
- b) Describe working principle of Hot-wire anemometer constant current and constant temperature type. [5]
- Q8)** a) Give selection criteria for transducers among many available types for the measurement of physical parameter. [5]
- b) List the temperature transducers. What is Thermistor? State advantages, limitations and applications of thermistor. [5]



Total No. of Questions : 8]

SEAT No. :

P1780

[Total No. of Pages : 4

[5231] - 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 right indicate full marks.*
- 4) *Draw neat diagram wherever necessary.*

Q1) Attempt the following :

- a) Draw data memory map of Atmega 16 Microcontroller. Write ALP to copy a block of 16 bytes of data from RAM locations starting from 50H to RAM location starting at 60H. **[4]**
- b) Draw simplified view of PIC18 microcontroller. Write features of PIC18F458/PIC18F4550. **[3]**
- c) List any three characteristics of embedded system that distinguishes it from general purpose computer system. List two examples of embedded system. **[3]**

Q2) Attempt the following:

- a) Explain with block diagram Timer 0 of Atmega16 microcontroller. **[4]**
- b) Write features of ADC module in PIC18F458 or PIC18F4550 microcontroller. Write steps in programming ADC using polling. **[3]**
- c) Compare - Harvard and Von-Neumann architecture. **[3]**

P.T.O.

Q3) Attempt the following:

- a) Draw interfacing of DAC0808 to Atmega 16 microcontroller. Write C program to generate a stair - step ramp waveform. [4]
- b) For PIC18F458/PIC18F 4550 microcontroller, find the value of PR2, CCP1RL, DC1B2 : DC1B1 to generate 10KHz PWM output. Assume XTAL = 8MHz. Prescalar = 1, Duty cycle = 50%. [3]
- c) What is cross assembler? What is IDE? Write typical IDE used with AVR and PIC based embedded system design. [3]

Q4) Attempt the following:

- a) Draw the interface of 16×2 LCD to PIC18F458 or PIC18F4550 microcontroller. Write C program to display "SPPU" at the center of first line of LCD. [4]
- b) List SFRs associated with I/O ports of Atmega16 microcontroller. Write C program to read 4DIP switches connected to pin D0-D3 and write to 4 LEDs connected to pin D4-D7 of PORTD continuously. [3]
- c) Explain RS232 bus standard. Write comparison between RS232 and RS485. [3]

Q5) Attempt the following:

- a) Draw data and code memory organization of PIC18F458/PIC18F4550 microcontroller. Explain File register and access bank in it. [4]
- b) Write C program/ALP for Atmega16 microcontroller to implement 8-bit ring counter on 8-LEDs connected to PORTB. [3]
- c) Explain SPI communication protocol. [3]

Q6) Attempt the following:

- a) Assume WREG has 2-digit packed BCD number. Write ALP for PIC18F458/PIC18F4550 microcontroller to convert 2-digit packed BCD number to two ASCII numbers and place them in file register location 6 and 7. [4]
- b) What is watchdog timer? Why is it used? Explain with suitable example the use of watchdog timer for Atmega 16 microcontroller. [3]
- c) Explain I2C communication protocol. [3]

Q7) Attempt the following:

- a) Draw stepper motor interface to PIC18F458 or PIC1BF4550 microcontroller. Write C program to monitor RBO, RBI pins of PORTB and rotate the motor as per following table [5]

| RBI | RBO | |
|-----|-----|---|
| 0 | 0 | Stop motor |
| 0 | 1 | rotate motor in clockwise direction |
| 1 | 0 | rotate motor in anticlockwise direction |
| 1 | 1 | stop motor |

- b)
 - i) Explain in detail hardware development tools used in embedded system design.
 - ii) Compare RISC and CISC architecture. [5]

Q8) Attempt the following:

- a) Explain with suitable timing diagram, Fast PWM mode in 8-bit timer of Atmega16 microcontroller. Write C program to generate non-inverted, Fast PWM output with frequency 31250Hz and duty cycle 75%. Assume XTAL = 8 MHz. **[5]**

TCCRO :

| | | | | | | | |
|------|-------|-------|-------|-------|------|------|------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| FOCO | WGM00 | COM01 | COM00 | WGM01 | CS02 | CS01 | CS00 |

- b) Draw block diagram of white line follower robot using microcontroller which uses two DC motors for left and right wheel. Three IR sensors to check whether robot is on track. Explain which microcontroller you will choose and which resources of microcontroller you will use. Draw flow chart for robot explained above. **[5]**



Total No. of Questions : 6]

SEAT No. :

P1781

[5231]-204

[Total No. of Pages : 2

M.Sc. - I

ELECTRONIC SCIENCE

**EL2UT 08 : Foundation of Semiconductor Devices
(2013 Pattern) (Semester - II) (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 indicate fullmarks.*

Q1) Attempt the following.

- a) Obtain the wave function for a particle in a one dimensional potential well using schrodinger's wave equation show that the energy of the particle can have only particular discrete values. **[4]**
- b) Define the terms : **[3]**
 - i) Diffusion current.
 - ii) Mobility.
 - iii) Drift velocity
- c) What are Miller indices ? What is the advantage of using reciprocal lattice?**[3]**

Q2) Attempt the following :

- a) Explain Hybrid Pⁱ equivalent circuit of BJT. **[4]**
- b) What is reverse breakdown in pⁿ junction? **[3]**
- c) The lowest energy of a particle in an infinite potential well with a width of 100 Å is 0.025eV what is the mass of the particle? **[3]**

Q3) Attempt the following.

- a) Discuss qualitatively J_D - V_D curve for variation of negative gate bias for JFET. Explain pinch-off variation for negative gate bias voltage. **[4]**
- b) Describe the lattice structure of simple cubic and face centred cubic lattice. **[3]**

Obtain the packing fraction of BCC structure.
- c) Explain Fermi - Dirac distribution function in detail. Calculate the probability that an energy state above E_F - is occupied by an electron.**[3]**

P.T.O.

Q4) Attempt the following :

- a) Explain Hall effect, obtain an expression for hole concentration P_o in terms of Hall voltage, current through the sample and magnetic field. [4]
- b) Write a short note on epitaxial growth method to develop a pure crystal. [3]
- c) Define the following performance parameters of a transistor (BJT) amplifier. [3]
 - i) Base transport factor.
 - ii) Current amplification factor,
 - iii) Current transfer ratio.

Q5) Attempt the following :

- a) Explain drift current density. Write the equation for the total drift current density. [5]
- b) What is ambipolar transport? Derive an equation for ambipolar transport? [5]

Q6) Attempt the following :

- a) Explain the ideal current - voltage relation for n-channel MOSFET for. [5]
 - i) Enhancement mode.
 - ii) Depletion mode.
- b) A Silicon p^n junction at $T = 300\text{ K}$ is doped with impurity concentration of $N_d = 5 \times 10^{16}\text{ cm}^{-3}$ and $N_a = 2 \times 10^{16}\text{ cm}^{-3}$.
The junction is forward biased at $V_a = 0.610\text{ V}$. Determine the minority carrier concentration at the space charge edges. [5]



Total No. of Questions : 8]

SEAT No. :

P1782

[5231]-301

[Total No. of Pages : 2

M.Sc. - II

ELECTRONIC SCIENCE

EL3UT09 : 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) With the help of block diagram, explain the basic elements of communication system. **[4]**

b) With the help of diagram, explain the working principle of quadrature amplitude modulation in short. **[3]**

c) What is non-resonant antennas? Write the characteristics of it. **[3]**

Q2) a) With the help of neat diagram, describe integrated services digital networks (ISDN). **[4]**

b) When the carrier and one of the side bands are suppressed in an Am wave to a depth of 50%. Calculate the percentage of power saving. **[3]**

c) Draw the block diagram of amplitude shift keying (ASK) and explain it in short. (Transmitter) **[3]**

Q3) a) Draw the diagram of parabolic reflector antenna and explain it in short. Write the features of it. **[4]**

b) Draw the block diagram of digital exchange and explain its operation in short. **[3]**

c) With the help of circuit diagram, explain the working of balanced modulator using diodes for SSB generation. **[3]**

P.T.O.

- Q4)** a) List the types of codes used for data transmission. Describe any two of them in short. Write their strengths and weaknesses. [4]
- b) Draw the diagram of broadside array antenna. Explain its working in short and draw its radiation pattern [3]
- c) Draw the block diagram of basic very small aperture terminal (VSAT) satellite communication system and explain each block in short. [3]
- Q5)** a) Draw the circuit diagram of balanced ratio detector and explain its working in short. [4]
- b) Draw the block diagram of frequency division multiplexing. Write the working of it in short. [3]
- c) With the help of neat diagram, explain the working of switch beam smart antenna in short. [3]
- Q6)** a) What is 3G? Write the characteristics of it. Write the advantages and disadvantages of 3G. [4]
- b) With the help of block diagram, explain the working of single sideband generation (SSB) using phase shift method. [3]
- c) Draw the SDLC frame format and explain the function of each field in short. [3]
- Q7)** a) Draw the diagram of antenna π coupler and explain it in short. [4]
- b) With the help of neat diagram, explain any two types of couplers used in optical fiber communication system. [3]
- c) Draw the block diagram of FM receiver and explain the function of each block in short. [3]
- Q8)** a) Draw the block diagram of adaptive delta modulation. Explain its working in short. Write the advantages of it over delta modulation. [4]
- b) Describe the ground wave propagation of electromagnetic waves. [3]
- c) Write the characteristics of code division multiple access (CDMA) and write the advantages of it. [3]



Total No. of Questions : 8]

SEAT No. :

P1783

[5231]-401

[Total No. of Pages : 2

M.Sc. - II

ELECTRONIC SCIENCE

EL4UT-10 : Control Systems

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

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.*

Q1) Attempt the following:

- a) Write a short note on Solenoids. **[4]**
- b) Explain critical rules for block diagram reduction. **[3]**
- c) What is offset error? How it is reduced? **[3]**

Q2) Attempt the following:

- a) With the help of block diagram, describe the various blocks of feedback control system. **[4]**
- b) Define transfer function. Explain its features and advantages. **[3]**
- c) Comment on the statement, "Integrall mode cannot be used alone". **[3]**

Q3) Attempt the following:

- a) Using Routh - Hurwitz stability criteria, determine the stability of system having denominator polynomial $D(S) = S^4 + 2S^3 + S^2 + 4S + 2$. **[4]**
- b) Explain the working principle of servomotor. **[3]**
- c) Distinguish between continous control and discrete state process control. **[3]**

P.T.O.

Q4) Attempt the following:

- a) Explain the working of ON - OFF controller. What is meant by differential gap? Why it is necessary? [4]
- b) What is meant by process loop tuning? List different methods of process loop tuning. [3]
- c) Write a short note on standard graphics symbols for process control. [3]

Q5) Attempt the following:

- a) How stability is predicted from Bode plots? Define gain and phase margins. [4]
- b) Explain the concept of control system stability with suitable example. [3]
- c) Describe the action of three position analog controller. [3]

Q6) Attempt the following:

- a) Sketch the outputs of P, PI and PID Controllers for step input. [4]
- b) Explain Nyquist stability criteria to determine stability of system. [3]
- c) Explain feed forward control system in short. [3]

Q7) Attempt the following:

- a) What is meant by DCS? Explain using appropriate diagram. [5]
- b) Define the term root locus. Explain essential conditions that every point on the root locus must satisfy. [5]

Q8) Attempt the following:

- a) For proportional controller, the controlled variable is a process temperature with range of 50 to 130°C and a set point of 73.5°C. Under normal conditions, set point is maintained with an output of 50%. Find the proportional offset resulting from a load change that requires a 55% output if proportional gain is [5]
 - i) 0.1
 - ii) 0.7
 - iii) 2.0
 - iv) 5.0
- b) Explain the application of control system in paper tension control system. [5]

