

Total No. of Questions : 8]

SEAT No. :

**P1709**

**[5131]-101**

[Total No. of Pages : 3

**M.Sc. - I**

**ELECTRONIC SCIENCE**

**EL1UT0 1 : Mathematical Methods in Electronics and Network  
Analysis**

**(2013 Pattern) (Semester - I) (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)** Attempt the following:

- a) State & Explain different types of modeling. Explain any one with suitable example. **[4]**
- b) What are the order & degree of differential equation? Give examples of each. What is meant by Linear differential equation? **[3]**
- c) Draw block diagram of two port network. Define voltage, current, transfer admittance and transfer impedance function. **[3]**

**Q2)** Attempt the following:

- a) What is meant by partial differential equation? Give any three examples with partial differential equation in physics. **[4]**
- b) Define Z transform. Find 2-transform of **[3]**
  - i) unit pulse or impulse
  - ii) unit step sequence
- c) What is meant by T to  $\pi$  &  $\pi$  to T transformation? convert T network to  $\pi$  network for given  $R_1 = 10\Omega$ ,  $R_2 = 20\Omega$  and  $R_3 = 40\Omega$ . **[3]**

**P.T.O.**

**Q3)** Attempt the following:

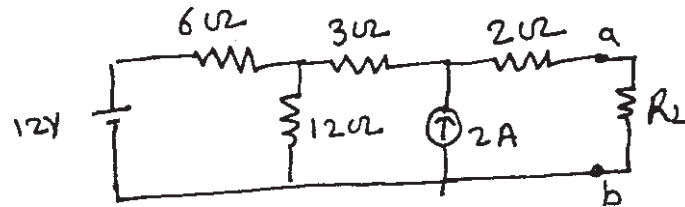
- a) Test the following polynomial is Hurwitz polynomial or not

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

- b) Explain the terms: Mesh, Node and Link of the network. [3]
- c) Determine the unit step response to the series R-C circuit using differential equation. [3]

**Q4)** Attempt the following:

- a) State and prove Maximum power transfer theorem. Find the value  $R_L$  of for Maximum power transfer in the following circuit. [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. Given  $R = 4\Omega$ ,  $L = 1H$ ,  $C = 0.25F$  and input voltage is 8V. [3]
- c) Write Bessel differential equation. List application of Bessel equation in physics and Electronics Field. [3]

**Q5)** Attempt the following:

- a) The co-ordinate of point P in Cartesian co-ordinates system are (1, 3, 5). Determine co-ordinates system in cylindrical and spherical co-ordinates system. [4]

- b) State Final Value theorem. Using this theorem determine the final value

of  $F(S) = \frac{10(S+1)}{S(S^2+2S+2)}$ . [3]

- c) State Thevenin and Norton theorem. Draw its equivalent circuits. Explain limitation of these theorems. [3]

**Q6)** Attempt the following:

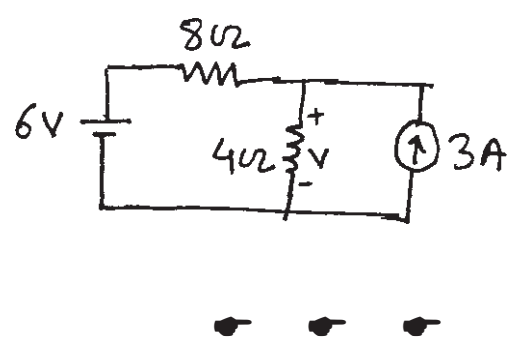
- a) What is meant by state variables? What is the advantage of state variable method over transfer function in modeling a system? [4]
- b) Define pole & zero of transfer function. What is meant by dominant pole? [3]
- c) Draw circuit diagram of op-amp first order Butterworth low pass filter. Determine its transfer Function in S domain. [3]

**Q7)** Attempt the following:

- a) "Mechanical Physical quantities can be shown to be analogous to electrical quantities". Elaborate statement using appropriate examples. [5]
- b) Separate the variable of 2 dimensional Laplace equation in spherical co-ordinate system and hence obtain the solution for it. [5]

**Q8)** Attempt the following:

- a) Define Laplace Transformation and state its advantages over classical method. Determine Laplace transform for [5]
  - i) Unit Step Function
  - ii) Cosine Function.
- b) Explain superposition theorem. Use the super position theorem to Find V in the following circuit. [5]



Total No. of Questions : 8]

SEAT No. :

P1710

[5131]-102

[Total No. of Pages : 3

M.Sc. - I

ELECTRONIC SCIENCE

EL1 UT 02 : Analogue Circuit Design

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

Time : 3 Hours]

[Max. Marks : 50

Instructions to the candidates:

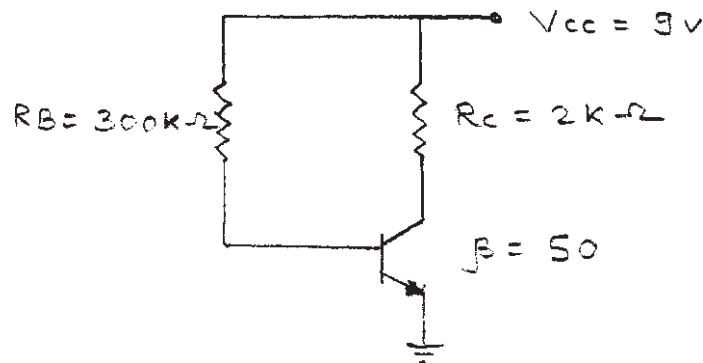
- 1) Attempt any five questions.
- 2) All questions carry equal marks.
- 3) Use of log table/non-programmable calculator is allowed.
- 4) Figures to the right indicate full marks.

Q1) Attempt the following:

- a) With neat sketches and characteristics curve, explain operation of junction FET. [4]
- b) What is filter? Design high pass filter with cut off frequency 1 kHz, and pass band gain of 2 using op-amp. [3]
- c) Draw the circuit diagram of Colpitt's oscillator and explain its working. Write down the expression for frequency of oscillation. [3]

Q2) Attempt the following:

- a) What is tuned amplifier? Explain stagger tuned amplifier with circuit diagram and characteristics. [4]
- b) Explain with the help of suitable circuit diagram, different coupling schemes used in amplifier. [3]
- c) Find the collector current and collector to emitter voltage for the given circuit [3]



P.T.O.

**Q3)** Attempt the following:

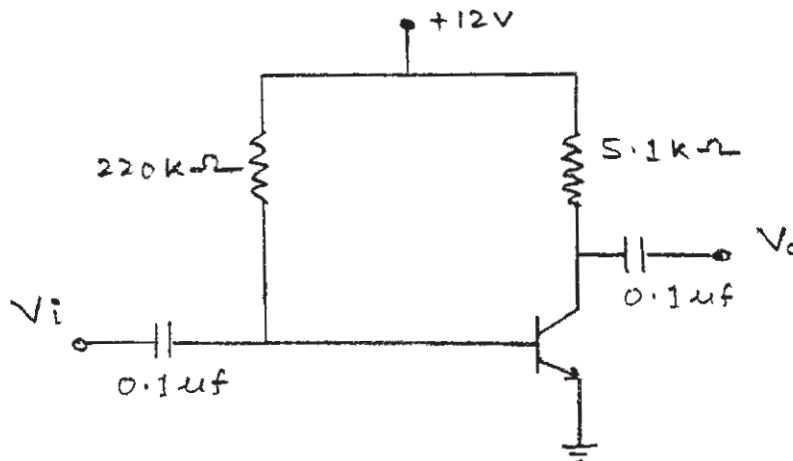
- a) State types of biasing. Explain voltage divider bias circuit and derive an expression for its stability factor. [4]
- b) Draw block diagram of PLL and explain function of each block. State applications of it. [3]
- c) Draw circuit diagram of single stage RC coupled BJT amplifier. State role of bypass capacitor. [3]

**Q4)** Attempt the following:

- a) Explain the effect of temperature on I-V characteristics of P-N Junction diode. Determine forward resistance of P-N junction diode when forward current is 5mA at  $T = 300\text{ K}$ . Assume silicon diode. [4]
- b) A crystal has following parameters:-  $L = 0.5\text{ H}$ ,  $C_s = 0.06\text{ pF}$ ,  $C_p = 1\text{ pF}$  and  $R = 500\Omega$ . Find series and parallel resonant frequency. [3]
- c) Compare BJT and MOSFET. [3]

**Q5)** Attempt the following:

- a) What is clamper? Discuss with the help of circuit diagram and waveforms, the operation of a clamper circuit. [4]
- b) Determine input impedance, output impedance, voltage gain and current gain for CE amplifier of given circuit. The h - parameters of the transistor are  $h_{fe} = 60$ ,  $h_{ie} = 500\Omega$  at  $I_c = 3\text{ mA}$ . [3]



- c) Draw the circuit diagram of practical differentiator circuit using op-amp and give designing steps of it. [3]

**Q6)** Attempt the following:

- a) Compare  $C_E$ ,  $C_B$  and  $C_C$  configurations. A transistor has  $I_E = 10$  mA and  $\alpha = 0.98$ . Determine values of  $I_C$  and  $I_B$ . [4]
- b) Draw circuit diagram of Wien Bridge oscillator and explain its operation. Derive expression for frequency of oscillation of it. [3]
- c) In Hartley oscillator, value of capacitor in tuned circuit is 500 pf and two sections of coil have inductances 38 $\mu$ H and 12 $\mu$ H. Find frequency of oscillation and feedback factor  $\beta$ . [3]

**Q7)** Attempt the following:

- a) Obtain expression for input impedance and output impedance with negative feedback for inverting amplifier. [5]
- b) Draw circuit diagram of RC phase shift oscillator using BJT and explain its working. Find value of C in RC phase shift oscillator designed for frequency of 1 kHz having value of R 10k $\Omega$ . [5]

**Q8)** Attempt the following:

- a) What is distortion? State different types of distortions in amplifier and explain them. [5]
- b) Explain the following terms in brief associated with op-amp. [5]
  - i) Input offset voltage
  - ii) Input offset current
  - iii) Input bias current
  - iv) CMRR
  - v) Slew rate

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Total No. of Questions :8]

SEAT No. :

P1711

[Total No. of Pages :4

[5131] - 103

M.Sc. -I

ELECTRONIC SCIENCE

EL1 UT 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.*
- 3) *Use of log tables /non programmable calculator is allowed.*
- 4) *Figures to the right indicate full marks.*

**Q1)** Attempt the following:

- a) Write a verilog code for a four bit ALU with four logical and four arithmetic operations using. **[4]**
  - i) Case statement
  - ii) If else statement
- b) Design a combinational circuit which accepts three bit binary number and converts it to equivalent excess - 3 code. **[3]**
- c) What are the system tasks & compiler directives in verilog. state any two with syntax. **[3]**

**Q2)** Attempt the following:

- a) Design a combinational circuit with four inputs and one output. The output is '1' if **[4]**
  - i) at least one of the inputs  $x_1$  and  $x_2$  is equal to '1' and both  $x_4$  and  $x_3$  are equal to '1'.
  - ii) if  $x_1 = x_2 = '0'$  and either  $x_3$  or  $x_4$  is '1'.

**P.T.O.**

- b) Give the classification of semiconductor memory, stating their types and characteristics. [3]
- c) Write a verilog code to implement 4:1 multiplexer using [3]
  - i) Dataflow modelling
  - ii) Behavioral modelling

**Q3)** Attempt the following:

- a) Distinguish between PLA and PAL

Implement the following using PLA

$$f(x, y, z) = \sum_m(0, 3, 5, 6). \quad [4]$$

- b) What is a test bench? Write a test bench for a four bit ALU. [3]
- c) Draw block diagram for Mealy machine and distinguish between Mealy and Moore state machine. [3]

**Q4)** Attempt the following:

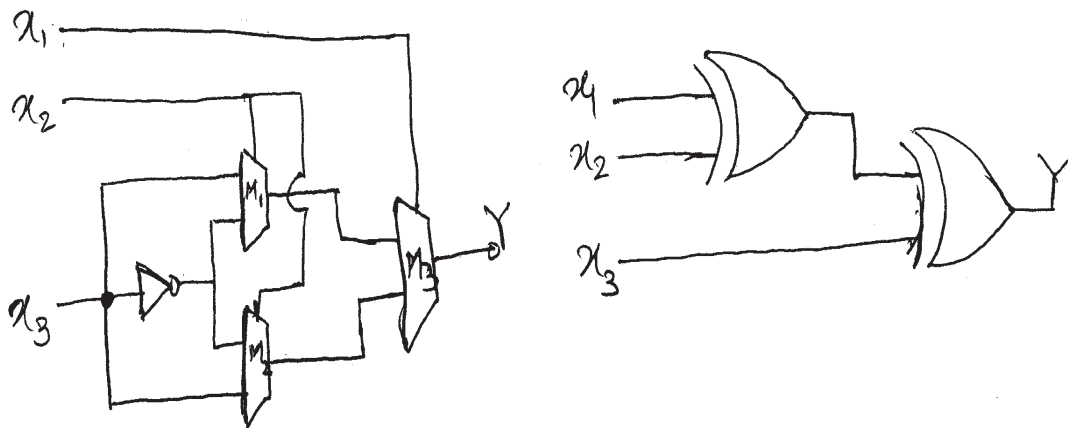
- a) Write a verilog module 'Parity' along with a function "Calc-Parity" written in the same module which accepts a eight bit address as input and calculates the parity of the address. [4]
- b) Explain the flow for digital system design using FPGA | CPLD. [3]
- c) Explain the terms state table and excitation table. Draw state diagram for T-flip flop. [3]

**Q5)** Attempt the following:

- a) Design a synchronous counter to generate the following sequence 0, 2, 4, 5, 0 .... using T flip-flops. Give all steps involved and draw the final hardware diagram. [4]



- b) Show that the following circuits are functionally equivalent, where M1, M2 & M3 are 2:1 multiplexes. [3]



- c) Draw the circuit and timing diagram of a four bit Johnson counter. [3]

**Q6)** Attempt the following:

- a) Write a module “full-adder” along with a task “adder” which accepts two four-bit numbers as input and returns sum and carry as outputs. [4]
- b) Explain with a neat diagram working of a DRAM cell with respect to read and write operations. [3]
- c) What is the difference between blocking and non-blocking assignments. Mention the simulation time at which the statements below are executed. [3]

begin

x = 0; y = 0; z = 0;

count = 0;

reg - a <= # 15 1' b1;

reg - b [3:0] <= # 10 {x, y, z}

count <= count + 1;

end

**Q7)** Attempt the following:

- a) Design a Traffic light controller using FSM in verilog. [5]
- b) State with syntax & examples the data types and operator types in verilog. [5]

**Q8)** Attempt the following:

- a) Explain in detail the architecture of FPGA. State the advantages of FPGA over microcontrollers. [5]
- b) Write verilog code for RS latch, using NAND gate. Use gate level modelling. Write verilog code for JK flip-flop using behavioural modelling. [5]

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Total No. of Questions : 6]

SEAT No. :

**P1712**

**[5131]-104**

[Total No. of Pages : 2

**M.Sc.**

**ELECTRONIC SCIENCE**

**EL1UT-04: 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 indicate full marks.*

**Q1)** Answer the following:

- a) Explain with example the difference between declaration and definition of a function. **[4]**
- b) Discuss with example the primary data types of C-language. What are the data type modifiers? **[3]**
- c) Explain with example the scope of variables in C. **[3]**

**Q2)** Answer the following :

- a) Discuss the types of storage classes available in C. **[4]**
- b) Discuss the decision making statements of C. **[3]**
- c) Write a C-program to find the factorial of 4 using recursive function. **[3]**

**Q3)** Answer the following:

- a) Write a C-program to draw the symbol of PNP transistor using graphics functions. **[4]**
- b) Explain the C-language functions available to handle the parallel port of computer. **[3]**
- c) Explain the various memory allocation functions available in C-language. **[3]**

**P.T.O.**

**Q4)** Answer the following:

- a) Explain the concept of class and object in C++. [4]
- b) Explain the operator and function overloading in C++. [3]
- c) Distinguish between C and C++. [3]

**Q5)** Answer the following:

- a) Write a C-program to reverse a string using pointers. [5]
- b) Write a C-program to create a file to store information about a student (name, roll no, marks). [5]

**Q6)** Answer the following:

- a) Write a short note on “video adapters and video graphics modes”. [5]
- b) Explain the following file functions with example.
  - i) fseek(),
  - ii) fgetc(),
  - iii) rewind(). [5]



Total No. of Questions : 8]

SEAT No. :

**P1713**

**[5131]-201**

[Total No. of Pages : 3

**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 calculators is allowed.*

**Q1)** Answer the following questions:

- a) A loss-less transmission line has velocity of propagation  $2.5 \times 10^8$  m/s, capacitance per unit length is 30pF/m. Find its inductance per unit length and phase constant at 100 MHz. Hence find its characteristic impedance. **[4]**
- b) A transmission line operating at 400 MHz has  $Z_0=60\Omega$ ,  $\alpha=0.04$  Np/m,  $\beta=1.5$  radian/m. Find R and G for the line. **[3]**
- c) Determine the cut-off frequency of an air filled rectangular waveguide with inner dimensions 15cm  $\times$  15 cm. **[3]**

**Q2)** Answer the following questions:

- a) A parallel plate waveguide consists of two shells of good conductor separated by 10 cm. Find the propagation constant at 10GHz when operated in  $TE_1$  mode. **[4]**
- b) Define : Radiation Intensity and Directive Gain of an antenna. **[3]**
- c) How much power should a Hertzian dipole of length  $\frac{\lambda}{25}$  transmit to get magnetic field strength of  $3\mu A/m$  at a point on  $\theta=\pi/2$  at 1 km distance from the antenna? **[3]**

Hint: use  $|H_{\phi_s}| = \frac{I_0 \beta dl \sin\theta}{4\pi r}$  and  $P_{rad} = 40\pi^2 \left[ \frac{dl}{\lambda} \right]^2 I_0^2$

**P.T.O.**

**Q3)** Answer the following questions:

- a) Obtain the expression for Poynting vector from Maxwell's equations. Explain each term in the expression. [4]
- b) Determine the phase constant  $\beta$  for a wave travelling in free space, if its frequency is 100MHz. [3]

$$(\mu_0 = 4\pi \times 10^{-7} \text{ H/m}; \epsilon_0 = \frac{1}{36\pi} \times 10^{-9} \text{ F/m})$$

- c) Why is single stub matching impractical in certain cases? How does double stub matching resolve this problem? Explain with necessary diagram. [3]

**Q4)** Answer the following questions:

- a) For a transmission line with characteristic impedance  $Z_0$  and load impedance  $Z_L$  show that the transmission coefficient  $T$  and reflection coefficient  $\Gamma$  are related as [4]

$$T^2 = \frac{Z_L}{Z_0} (1 - \Gamma^2)$$

- b) What is a cavity resonator? What are the commonly used cavity resonators? What happens when frequency of impressed signal is equal to resonant frequency? Write the expression for resonant frequency of rectangular cavity resonator. [3]
- c) What are 'Microwave Isolators'? Explain. [3]

**Q5)** Answer the following questions:

- a) Write a short note on EMI. (sources of EMI and EMI control techniques). [4]
- b) Write a short note on 'Patch antenna'. [3]
- c) Sea water has conductivity of 4 mhos/m and  $\epsilon_r = 20$  at a frequency of 4GHz. Find its intrinsic impedance. [3]

**Q6)** Answer the following questions:

- a) For normal incidence of a uniform plane wave on the boundary between two dielectric mediums show that

$$SWR = \frac{1+\Gamma}{1-\Gamma}$$

where  $\Gamma$ =reflection coefficient. [4]

- b) With the help of necessary diagrams show the methods of exciting TM and TE mode (any) in a circular waveguide. [3]
- c) Explain the working of a reflex klystron using its schematic diagram. [3]

**Q7)** Answer the following questions:

- a) In a non magnetic medium

$$\vec{E} = 5 \sin (2.5\pi \times 10^7 t - x) \hat{a}_z \text{ V/m.}$$

Find  $\epsilon_r$  (relative permittivity),  $\eta$  (intrinsic impedance), and time average power carried by the wave. [5]

- b) For a plane wave propagating through a conductor show that  $\alpha = \beta = \sqrt{\pi f \mu \sigma}$ , where  $\alpha$  is attenuation constant,  $\mu$  is permeability,  $\beta$  is phase constant and  $\sigma$  is conductivity of the medium. [5]

**Q8)** Answer the following questions:

- a) A 300m long transmission line has total resistance of 4.5 k $\Omega$ , total inductance 0.15mH, total conductance of 60 mmho and total capacitance of 12 nF. It is operated at 6 MHz. Find the propagation constant, characteristic impedance and velocity of propagation. (Hint : first determine the line constants i.e. R, L, G and C per unit length). [5]
- b) Obtain the decoupled voltage and current wave equations for a transmission line. Draw the necessary schematic circuit of the transmission line. [5]



Total No. of Questions : 8]

SEAT No. :

**P1714**

**[5131]-202**

[Total No. of Pages : 3

**M.Sc.**

**ELECTRONIC SCIENCE**

**EL2UT06 : Instrumentation and Measurement Techniques  
(2013 Pattern) (Semester - II)**

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

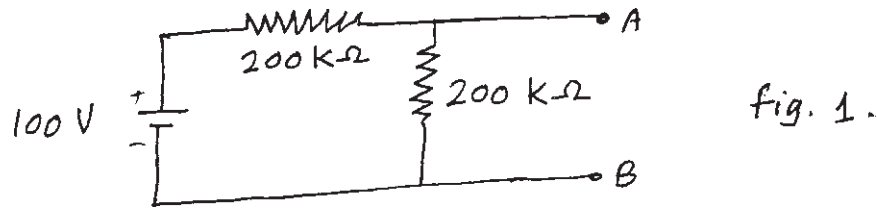
- 1) *Answer any Five questions.*
- 2) *All questions carry equal marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Figures to the right indicate full marks.*
- 5) *Use of non programmable calculator is allowed.*

- Q1) a)** Give detail classification of transducers. **[4]**
- b) Explain following characteristic parameters of measurement system. **[3]**
- i) Accuracy
  - ii) Precision and
  - iii) Sensitivity
- c) List the primary sensing elements for the measurement of physical parameters. **[3]**
- Q2) a)** State and explain dynamic characteristic parameters of measurement system. **[4]**
- b) What is measurement? State different methods of measurement. List the functions of measurement systems. **[3]**
- c) For a measurement system, explain the following terms:- **[3]**
- i) True value,
  - ii) Static error and
  - iii) Static correction with suitable example.

**P.T.O.**



- Q3) a)** A 50 V range voltmeter has resistance of  $1000\text{ K}\Omega$  is connected across terminal A and B as shown in fig.1. Find the reading of the voltmeter under open circuit and under loaded condition.



Find the accuracy and loading error if the voltmeter resistance is  $10\text{ K}\Omega$ , calculate the loading error and accuracy. Comment on your results. [4]

- b) What is noise? State and define three types of noise sources. Give noise factor and noise figure. [3]
- c) A set of 10 observations were recorded when measuring a voltage are: 41.7, 42.0, 41.8, 42.0, 42.1, 42.0, 41.9, 42.5, 41.8, and 41.9 V. Find mean, standard deviation, the probable error of one reading and probable error of mean and voltage range. [3]
- Q4) a)** The dynamic behavior of measurement system is studied in time and frequency domain. Give time domain analysis for standard test signals used. [4]
- b) A thermocouple system has a time constant of 10 sec, the system is used to measure the temperature of a furnace which fluctuates sinusoidally between  $640^\circ\text{C}$  and  $600^\circ\text{C}$  with a periodic time of 80 sec. Determine the maximum and minimum values of the temperature indicated by the system. Also calculate the phase angle and the time lag. [3]
- c) A Wheatstone bridge requires a change of  $5\Omega$  in the unknown arm to produce a change in deflection of 2 mm of the galvanometer. Determine the sensitivity and deflection factor. [3]
- Q5) a)** With neat circuit diagram explain LVDT. State advantages and disadvantages of it. Give at least two applications. [4]
- b) List the factors influencing the choice of transducer for measurement of physical parameter. [3]
- c) Give the list of transducers used for motion (translational / rotational) measurement. Explain control type synchros system. [3]

- Q6)** a) What is a strain gauge? Derive an expression for gauge factor for simple wire type strain gauge. [4]
- b) Explain how thermocouple used for temperature measurement. What is reference junction compensation and lead compensation? [3]
- c) A single strain gauge having resistance of  $120\ \Omega$  is mounted on steel cantilever beam at a distance of 0.15 m from the free end. An unknown force  $F$  is applied at the free end produces a deflection of 12.5 mm of the free end. The change in gauge resistance is found to be  $0.15\ \Omega$ . The beam is 0.25 m long with 20 mm width and depth of 3 mm. Young's modulus of steel is  $200\ \text{GN/m}^2$ . Calculate the gauge factor. [3]
- Q7)** a) List the primary and secondary transducers used for pressure measurement. Explain working principle of Ionization gauge. [5]
- b) State the different methods of flow measurement. Give working principle of Ultrasonic flow meter and electromagnetic flow meter. [5]
- Q8)** a) Give the transducers used for temperature measurement. Explain working of RTD. State the disadvantages of it, explain the modifications in Wheatstone bridge to overcome the disadvantages. [5]
- b) What is torque? Give different methods of measurement of torque. Explain moving magnet and moving coil velocity transducers. [5]

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Total No. of Questions : 8]

SEAT No. :

**P1715**

**[5131]-203**

[Total No. of Pages : 3

**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 and code memory map of Atmega16 microcontroller. Write ALP to add five 8-bit numbers from data RAM locations 50h-54h; store 16-bit result in RAM locations 55h-56h. **[4]**
- b) List any six features of PIC18F458/PIC18F4550 microcontroller **[3]**
- c) Draw block diagram of typical embedded system and explain all the components used in it. **[3]**

**Q2)** Attempt the following:

- a) Explain SFRs associated with I/O ports of Atmega16 microcontroller. Write ALP to toggle all the bits of PORTD. **[4]**
- b) Draw simplified view of PIC microcontroller . Write the meaning of following instructions.  
i) DECFSZ 0x02,F    ii) ADDWFC 0x03,1    iii) RLFC 0x04,F **[3]**
- c) Write short note on IDE and ICE. **[3]**

**Q3)** Attempt the following:

- a) Compare Fast PWM and phase correct PWM in Atmega 16 microcontroller. Find the value of TCCRO and OCRO registers to generate phase correct, non-inverted PWM with frequency 15686Hz and 75% duty cycle. Use XTAL =8MHz. **[4]**

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

TCCRO

**P.T.O.**

- b) Assume WREG has 2-digit packed BCD number, Write ALP for PIC18F458/PIC18F4550, to convert 2-digit packed BCD number to two ASCII numbers and place them in file register location 6 and 7. [3]
- c) What are the criteria, the designer should consider in choosing a microcontroller for embedded system development? [3]

**Q4)** Attempt the following:

- a) Four common cathode seven segment displays are connected to PIC18F458/ PIC18F4550 as multiplexed display. Write C program to display 'SPPU' Continuously on these displays. [4]
- b) Write C program for Atmega 16 microcontroller to generate 20KHz on bit 3 of PORTB, in CTC mode use XTAL = 8MHz. [3]
- c) Write comparison between RS232 and RsS485 [3]

**Q5)** Attempt the following:

- a) Draw interfacing of DAC0808 to PIC18F458 or PIC18F4550 microcontroller. Write C program to generate square wave using DAC, of amplitude 4Vp-p with 50% duty cycle. Use Vref = 5V. [4]
- b) Write C program for Atmega16 microcontroller to toggle LED connected at PORTD bit 0 continuously with delay of 1 sec. Use Timer1 Normal mode, No prescalar to generate delay. Assume XTAL = 8 MHz. [3]

TCCR1A:

COM1A1	COM1A0	COM1B1	COM1B0	FOC1A	FOC1B	WGM11	WGM10
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TCCR1B:

ICNC1	ICES1	–	WGM13	WGM12	CS12	CS11	CS10
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TIFR:

OCF2	TOV2	ICF1	OCF1A	OCF1B	TOV1	OCF0	TOV0
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- c) What is I2C? List I2C devices which can be interfaced with microcontroller state the advantage of I2C over SPI. [3]

**Q6)** Attempt the following:

- a) Draw interfacing of 16×2 LCD to PIC18F458 or PIC18F4550 microcontroller. Write C program to display 2-digit BCD counter on LCD. [4]
- b) Draw interface of temperature sensor LM35 and Heater (Using relay) to Atmega16. Write C program to implement ON-OFF temperature controller.

ADMUX: [3]

REFS1	REFS0	ADLAR	MUX4	MUX3	MUX2	MUX1	MUX0
-------	-------	-------	------	------	------	------	------

ADCSRA:

ADEN	ADSC	ADATE	ADIF	ADIE	ADPS2	ADPS1	ADPS0
------	------	-------	------	------	-------	-------	-------

c) What is ZigBee communication standard? State its specifications. [3]

**Q7)** Attempt the following:

a) What is Servo motor? Draw interface of servo motor to PIC18F458/ PIC18F4550. Write C program to rotate servo motor by 180° from its initial position 0°. Servo motor need 2.5 ms on time of 20ms period PWM. use FOSC = 125 KHz. (Internal). [5]

OSCCON:

D7	D6	D5	D4	D3	D2	D1	D0
IDLEN	IRCF2	IRCF1	IRCF0	OSTS	IOFS	SCS1	SCS0

CCPICON:

D7	D6	D5	D4	D3	D2	D1	D0
-	-	DC1B1	DC1B0	CCPIM3	CCPIM2	CCPIM1	CCPIM0

T2CON:

D7	D6	D5	D4	D3	D2	D1	D0
-	T2OUTPS3	T2OUTPS2	T2OUTPS1	T2OUTPS0	TMR2ON	T2CKPS1	T2CKPS0

b) What is embedded system? List features of embedded system. What is use of WDT in embedded system. [5]

**Q8)** Attempt the following

a) Draw block diagram of car parking controller using Atmega16. Assume INT0 pin of Atmega 16 is connected to IR entry sensor, INT1 pin is connected to IR exit sensor. Display number of car present using 8 LEDs connected to PORTA. Activate parking full indicator when number of car entered are 20. Write C program to implement car parking controller.

CICR: [5]

INT1	INT0	INT2	-	-	-	IVSEL	IVCE
------	------	------	---	---	---	-------	------

MCUCR:

SE	SM2	SM1	SM0	ISC11	ISC10	ISCO1	ISCO0
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b) List different communication features available in Atmega16 microcontroller. Write comparison between them. [5]



Total No. of Questions : 6]

SEAT No. :

**P1716**

**[5131]-204**

[Total No. of Pages : 2

**M.Sc. - I**

**ELECTRONIC SCIENCE**

**EL2UT08:Foundation of Semiconductor Devices**

**(2013 Pattern) (Semister - 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.*
- 5) *Use of Non-Programmable calculator is allowed*

**Q1)** Attempt the following:

- a) Explain Hybrid piequivalent circuit in BJT. **[4]**
- b) An abrupt silicon P-n junction consist of ap-type region containing  $2 \times 10^{16} \text{cm}^{-3}$  acceptors and n type region containing also  $10^{16} \text{cm}^{-3}$  acceptors in addition to  $10^{17} \text{cm}^{-3}$  donors. Calculate the thermal equilibrium density of electrons and holes in the p-type region as well as both densities in the n-type region  $n_i = 10^{10} \text{cm}^{-3}$ . **[3]**
- c) Explain the concept of an excess carrier life time. **[3]**

**Q2)** Attempt the following :

- a) Define ; Thermal conductivity, mobility, Drift carrier and diffusion current. **[4]**
- b) Describe internal pinch off voltage of JFET. **[3]**
- c) Calculate smallest possible uncertainty in position of an electron moving with velocity  $10^6 \text{m/s}$ . **[3]**

**Q3)** Attempt the following:

- a) With label diagram explain MESFET. **[4]**
- b) Explain Hull effect. Give it's application. **[3]**
- c) What is millar indices? Determine the Miller indices of plane which is parallel to x - axis & cuts intercepts of 2 & 1/2 respectively along y & z axis. **[3]**

**P.T.O.**

**Q4)** Attempt the following :

- a) Explain the terms in short [4]
  - i) basis
  - ii) Space lattice
  - iii) unit cell
  - iv) Lattice
- b) Define Fermi level and Fermi energy with it's importance. [3]
- c) What is break down in diode? What are it's types? [3]

**Q5)** Attempt the following :

- a) Explain the Czochralski methods for semiconductor crystal growth. [5]
- b) Obtain expression for electron diffusion current density and hole diffusion current density in semiconductor. Show the graphically the electron and hole concentration is a function of distance. [5]

**Q6)** Attempt the following:

- a) Explain the basic operation of MOS capacitor with suitable diagram. [5]
- b) Define Fermi energy. Explain Fermi Dirac distribution function in detail. [5]



Total No. of Questions : 8]

SEAT No. :

**P1717**

**[5131]-301**

[Total No. of Pages : 2

**M.Sc. - II**

**ELECTRONIC SCIENCE**

**EL3 UT09 : 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 indicate full marks.*

- Q1)** a) Write the significance of signal to noise ratio and noise figure. [4]
- b) Describe any two types of codes used for data transmission. [3]
- c) Draw the diagram of microwave horn antenna and explain it in short. [3]
- Q2)** a) Draw the block diagram of public switched telephone networks (PSTN) and describe it in short. [4]
- b) With the help of block diagram, explain the working of SSB generation using filter system. [3]
- c) With the help of neat diagram, explain the working of 8 quadrature amplitude modulator (QAM) in short. [3]
- Q3)** a) With the help of diagram, describe the sky wave propagation in short. [4]
- b) List the types of spread spectrum (SS). Explain any one of them in short. Write the advantages of SS. [3]
- c) With the help of block diagram, explain the working of FM receiver. [3]

**P.T.O.**



- Q4)** a) Draw the block diagram of time division multiplexing and explain it. [4]  
 b) What is resonant antennas? Write the characteristics of it. [3]  
 c) With the help of schematic diagram, explain cellulor telephone system.[3]
- Q5)** a) Draw the circuit diagram of balanced slope detector and explain its working in short. [4]  
 b) Draw the block diagram of frequency shift keying (FSK) and explain it in short. (Transmitter) [3]  
 c) Draw the diagram of cassegrain fed parabolied reflector antenna and explain its working. [3]
- Q6)** a) With the help of block diagram, explain very small aperature terminal (VSAT) earth station transmitter and receiver in short. [4]  
 b) Draw the circuit diagram of varactor diode FM generator and explain its working. [3]  
 c) Draw the block diagram of delta modulation. Explain its working in short. Write advantages and disadvantages of it. [3]
- Q7)** a) What is smart antennas? Write the advantages and disadvantages of it.[4]  
 b) With the help of block diagram, explain the fiber optic communication system. [3]  
 c) Calculate the percentage of power saving when the carrier and of the sidebands are suppressed in an AM wave modulated to a depth of 100%. [3]
- Q8)** a) Draw the block diagram of pulse code modulation (PCM). Explain the working of each block in short (Transmitter). [4]  
 b) With the help of diagram, explain the working of antenna direct coupling. [3]  
 c) Describe the 10 digit format of telephone numbering system. [3]



Total No. of Questions : 8]

SEAT No. :

**P1718**

**[5131]-401**

[Total No. of Pages : 3

**M.Sc.**

**ELECTRONIC SCIENCE**

**EL4UT 10 : Control Systems**

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

*Time : 3 Hours]*

*[Max. Marks : 50*

*Instructions to the candidates:*

- 1) *Answer any 5 questions.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicates full marks.*
- 4) *Use of non-programmable calculator is allowed.*

**Q1)** Attempt the following.

- a) Elaborate the following statement, “ Evolution of process Control has been from manual to computer to network control”. **[4]**
- b) Consider a control system with  $G(S)H(S) = \frac{K}{S(S+2)}$ . Obtain the nature of root locus. **[3]**
- c) Explain proportional control mode. What is an offset error. **[3]**

**Q2)** Attempt the following.

- a) Write a short note on control value. **[4]**
- b) Taking a suitable example, explain the concept of block diagram of a control system. **[3]**
- c) Comment on the statement; “Derivative mode cannot be used alone”. **[3]**

**Q3)** Attempt the following.

- a) Using Routh-Hurwitz Criteria, determine the stability of system having denominator polynomial.  $D(S) = S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$  **[4]**

**P.T.O.**

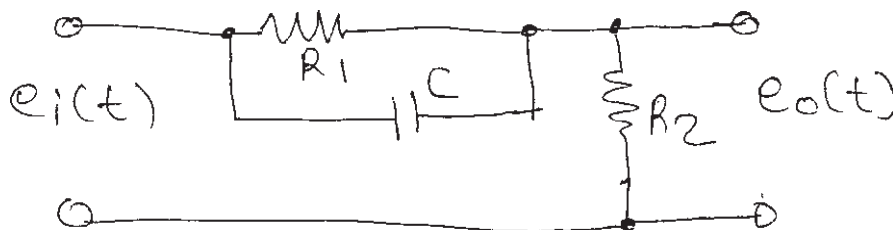
- b) Write a short note on position control system. [3]
- c) Write a short note on adaptive control. [3]

**Q4)** Attempt the following.

- a) With a neat diagram and equation, explain the working of PID Controller. [4]
- b) Explain the following terms [3]
  - i) Stable system.
  - ii) Unstable system and
  - iii) Critically stable system.
- c) Explain the construction and working of a solenoid. [3]

**Q5)** Attempt the following.

- a) Explain open loop transient response method for process loop tuning. [4]
- b) Obtain transfer function of lead network as shown below, [3]



- c) Explain the application of control system in room temperature control. [3]

**Q6)** Attempt the following.

- a) Compare the performance of P, PI and PID Controllers. [4]
- b) State the advantages and disadvantages of Nyquist plot. [3]
- c) Write a short note on SCADA. [3]

**Q7)** Attempt the following.

- a) With suitable examples, distinguish between **[5]**
  - i) Open loop and closed loop systems and
  - ii) Feed forward and feedback systems.
- b) How stability is predicted from Bode plots? Define gain and phase margins. **[5]**

**Q8)** Attempt the following.

- a) A liquid level control system linearly converts a displacement of 2 to 3m into 4 to 20 mA control signal. A relay serves as two-position controller to open and close the inlet valve. Relay closes at 12 mA and opens at 10 mA. Find
  - i) The relation between displacement level and current, and
  - ii) Neutral zone or displacement gap in meters. **[5]**
- b) Write a note on standard graphics symbols for process control and instrumentation. **[5]**

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