Total No. of Questions : 8]

SEAT No. :

P3127

[Total No. of Pages : 4

[5538]-101

M.Sc. - I

ELECTRONIC SCIENCE

EL1UT01 : Mathematical Methods in Electronics & Network Analysis

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

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

Instructions to the candidates:

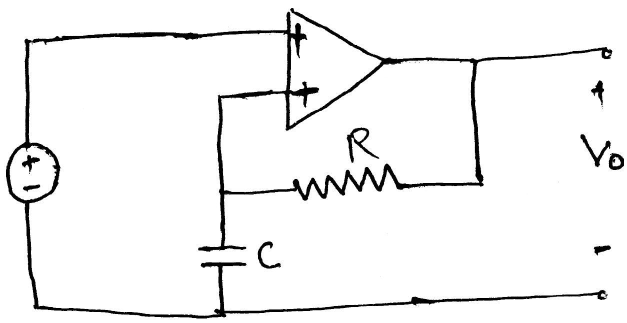
1) *Answer any five questions.*
2) *All questions carry equal marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right side indicate full marks.*
5) *Use of non-programmable calculator is allowed.*

Q1) Attempt the following :

a) State and explain different type of modeling. Derive the model of op amp based differentiator circuit. **[4]**

b) Solve the following differential equation $\frac{dy}{dx} = x(1-2y)$. **[3]**

c) Find gain $H(S) = V_0/V_s$ for op-amp based circuit. Assume initial conditions are zero. **[3]**



Q2) Attempt the following :

a) Explain natural response of series RLC circuit using differential equation. **[4]**

b) Draw pole zero plot for the current I(S) is in a network given by **[3]**

$$I(S) = \frac{5S}{(S+2)(S+4)(S+6)}$$

c) Define the terms : Input node, output node, mixed node. **[3]**

P.T.O.

Q3) Attempt the following :

a) Find the inverse Z transform of X(Z). **[4]**

$$X(Z) = \frac{1}{1 - 1.5Z^{-1} + 0.9Z^{-2}} \text{ for ROC } 0.5 < Z > 1.$$

b) Determine the Thevenin equivalent circuit as shown following fig. as seen by 5Ω resistor. Calculate the current flowing through 5Ω resistor. **[3]**

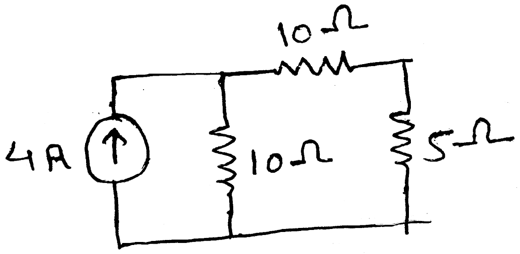
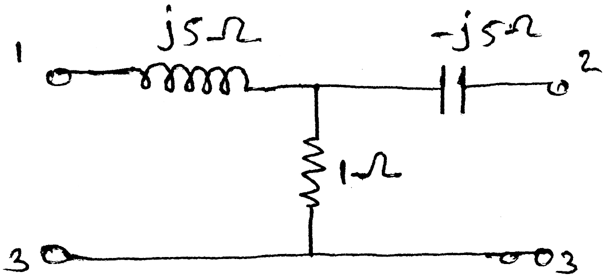


Fig. Q3 b)

c) What is mean by partial differential equation? Give example of PDE in physics and electronics. **[3]**

Q4) Attempt the following :

a) Find Pi network from T network for the following circuit. **[4]**



b) State final value theorem. Using final value theorem find i(t). Verify using inverse Laplace transform. **[3]**

$$I(S) = \frac{S+6}{S(S+3)}.$$

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

Q5) Attempt the following :

a) Write Bessel differential equation. Write its general solution. What do you mean by Bessel's function of kind? **[4]**

b) Obtain the Laplace transform of the following function **[3]**

i) $e^{-2t}\cos 3t\, u(t)$

ii) $e^{-2t}\sin 4t\, u(t)$.

c) Explain maximum power transform for ac circuits. **[3]**

Q6) Attempt the following :

a) Explain superposition theorem. Using superposition theorem find V_0 in the following circuit. **[4]**

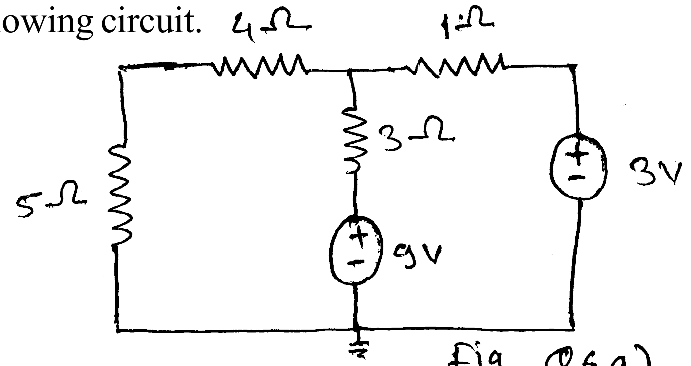


Fig Q6 a)

b) Check stability of polynomial D(S) using Routh Hurwitz criteria. **[3]**

$D(S) = S^4 + S^3 + S^2 + S + 3$.

c) Solve differential equation using Laplace transform **[3]**

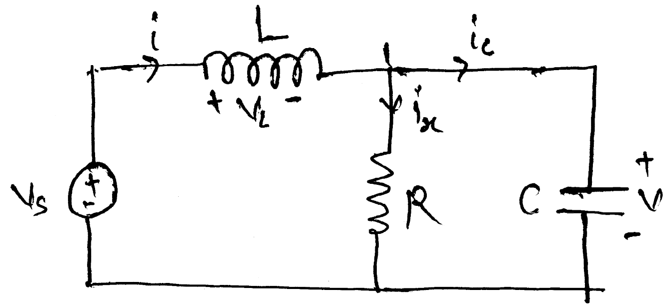
$$\frac{d^2i}{dt^2} + 3\frac{di}{dt} + 2i + \delta(t) = 0$$

For $t > 0$ if $i(0) = 0$ and $i'(0) = 3$.

Q7) Attempt the following :

a) Obtain the solution of one dimensional wave equation using variable seperation method. **[5]**

b) Find the state space representation of the following circuit. **[5]**



Q8) Attempt the following :

a) State convolution theorem. Find F(t) using convolution theorem. **[5]**

$$F(S)=\frac{2S}{(S+1)(S^2+4)}.$$

b) Explain force voltage analogy for element of mechanical rotational system. **[5]**

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Total No. of Questions : 8]

SEAT No. :

P3128

[Total No. of Pages : 4

[5538]-102
M.Sc. - I
ELECTRONIC SCIENCE
EL1UT02 : Analog 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 the questions carry equal marks.*
3) *Figures to the right indicate full marks.*
4) *Use of log table/non-programmable calculator is allowed.*

Q1) Answer the following questions:

a) Explain the terms D.C. forward resistance and A.C. forward resistance of diode. **[4]**

b) Write comparison between inverting and non-inverting amplifier w.r. to voltage gain, input impedance and bandwidth. **[3]**

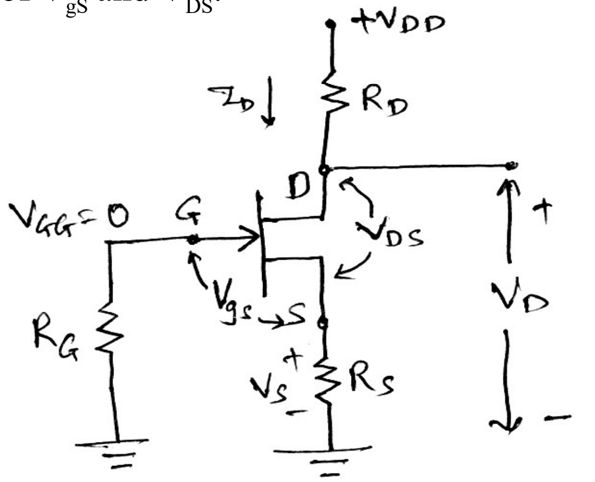
c) The tuned oscillator circuit used in the local oscillator of radio receiver makes use of an LC tuned circuit with L_1=58.6 μH and C_1=300 pF. Calculate the frequency of oscillations. **[3]**

Q2) Answer the following questions:

a) Define oscillator. Write selection criteria of oscillator while selecting for a particular application. **[4]**

b) In an amplifier, the output power is 1.5 Watt at 2 kHz and 0.3 Watt at 20 kHz, while the input power is constant at 10 mW. Determine by how many decibels is the gain at 20 Hz below that at 2 kHz. **[3]**

c) In the given circuit diagram, if I_D=5 mA, V_{DD}=10 V, R_D=1 kΩ and R_S=500 Ω. Find the values of V_{gS} and V_{DS}. **[3]**



P.T.O.

Q3) Answer the following questions:

a) With the help of neat block diagram explain phase lock loop used as a frequency multiplier. **[4]**

b) Explain how double tuned amplifier is different than single tuned amplifier. **[3]**

c) A Crystal has following parameters, L=0.5 H, C_S=0.06 pF, R=5 kΩ. Find the series resonant frequency and Q-factor of the crystal. **[3]**

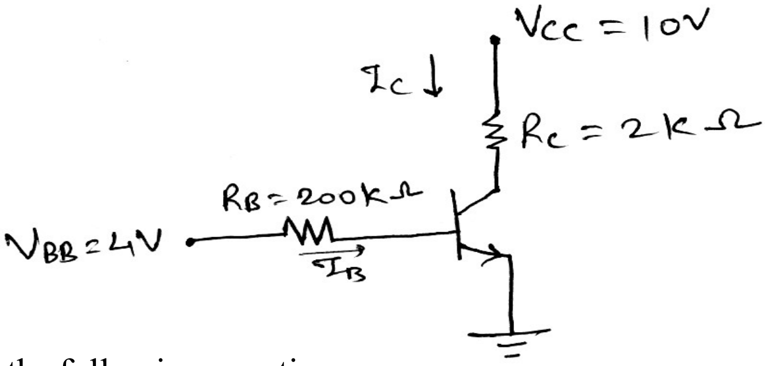
Q4) Answer the following questions:

a) Draw the diagram of two stage RC coupled amplifier. State one advantage and one disadvantage of two stage RC coupled amplifier. **[4]**

b) For an op-amp having slew rate of SR=2 V/μs, what is the maximum closed loop voltage gain that can be used when the input signal varies by 0.5 V in 10 μs? **[3]**

c) Determine the base, collector and emitter current for a common Emitter circuit as shown in following diagram. **[3]**

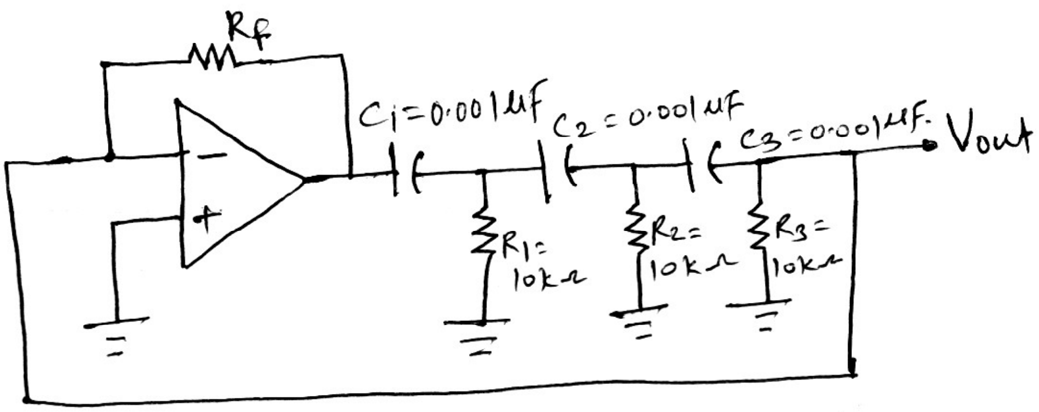
(V_{CC}=10 V, V_{BB}=4 V, R_B=2 kΩ, $V_{BE(on)}$=0.7 V, β=200.)



Q5) Answer the following questions:

a) With the help of neat diagram explain Avalanche breakdown. Write difference between Zener and Avalanche breakdown. **[4]**

b) For a given op-amp RC phase shift oscillator, determine the value of R_F necessary for the circuit and determine the frequency of oscillation. **[3]**



c) Draw and explain single stage RC coupled amplifier in common emitter configuration. **[3]**

Q6) Answer the following questions:

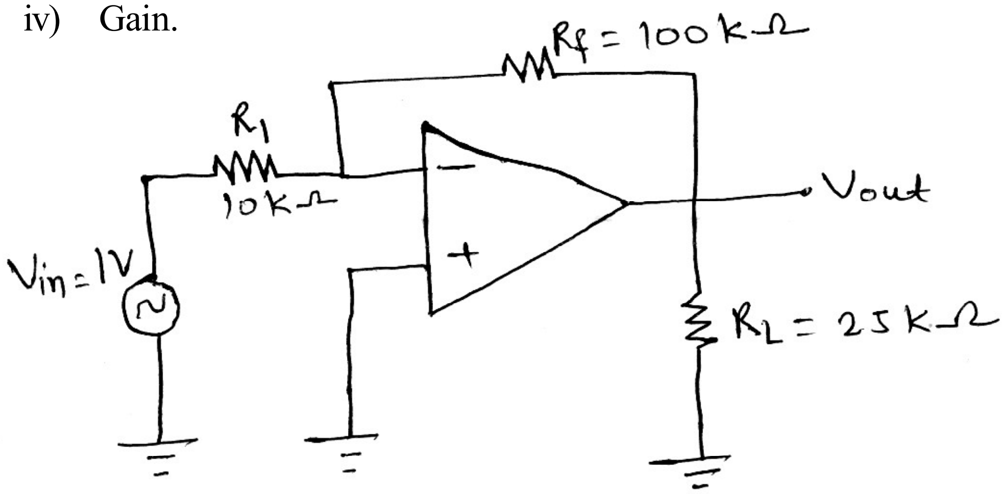
a) In the circuit shown below, R_1=10 kΩ, R_F=100 kΩ, V_{in}=1V. A load of 25 kΩ is connected to the output terminal. Find the value of - **[4]**

i) Input current.

ii) Output voltage.

iii) Load current.

iv) Gain.



b) Compare JFET and MOSFET. **[3]**

c) Why CMRR of three op-amp instrumentation amplifier is very high? State advantages of 3-op-amp instrumentation amplifier. **[3]**

Q7) Answer the following questions:

a) A non-inverting amplifier with a gain of 10 is to be driven with 2 volts peak to peak sine wave of 20 kHz frequency. What should be the minimum slew rate of op-amp to have distortion free output. **[5]**

b) In a colpitts oscillator, the values of the inductors and capacitors in the tank circuit are L=40 mH, C_1=100 pF and C_2=500 pF. **[5]**

i) Find the frequency of oscillations.

ii) If the output voltage is 10 V, find the feedback voltage.

iii) Find the minimum gains if the frequency is changed by changing L alone.

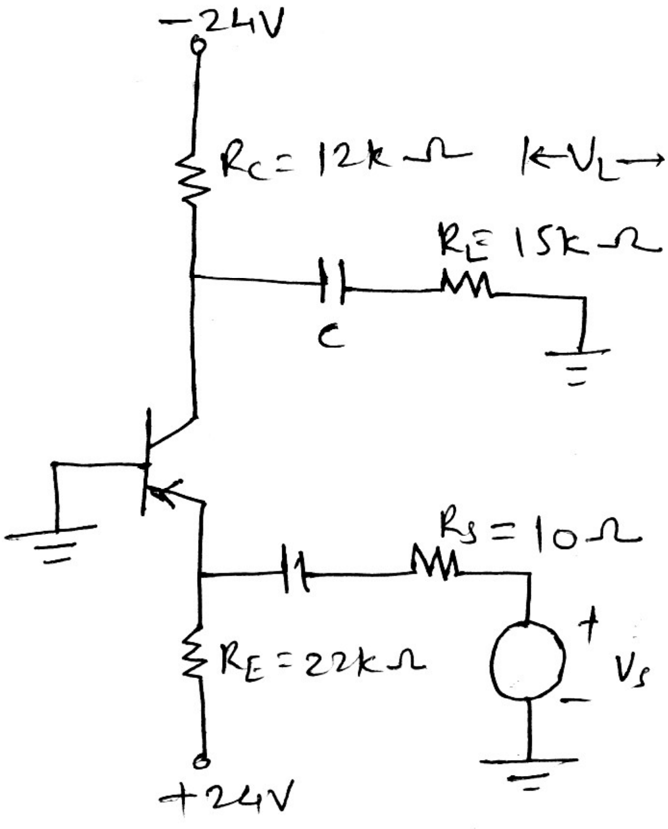
iv) Find the value of C_1 for a gain of 10.

v) Also, find the new frequency.

Q8) Answer the following questions:

a) With neat diagram explain the construction of n-channel MOSFET. State advantages of NMOS over PMOS. **[5]**

b) Find the voltage gain of the amplifier A_v, overall voltage gain $\left(\frac{V_L}{V_S}\right)$ and overall current gain $\left({}^{i_L}/_{i_S}\right)$ of the common base amplifier as shown in following figure. Assume the transistor used is Germanium. **[5]**



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Total No. of Questions : 8]

SEAT No. :

P3129

[Total No. of Pages : 2

[5538]-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) Answer the following questions.

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

b) Design a binary to gray code converter. **[3]**

c) What is state diagram? Draw the state diagram for S-R and J-K flip-flop. **[3]**

Q2) Answer the following questions.

a) Explain four bit serial in serial out - shift register with neat diagram. **[4]**

b) Compare the blocking and non blocking assignment in verilog. **[3]**

c) Minimize the following expression using k-map and realize it using logic gates. **[3]**

$Y = \Sigma m\ (1,4,6,8,10,12,15)$

Q3) Answer the following questions.

a) i) Write the verilog code for half adder circuit. **[2]**

ii) What is multiplexed display system? What are its advantages. **[2]**

b) Compare the synchronous and asynchronous counter. **[3]**

c) Explain memory. Write operation in DRAM cell using neat diagram. **[3]**

P.T.O.

Q4) Answer the following questions.

a) Draw the architecture of CPLD and explain it. **[4]**

b) What is verilog module? Explain it with neat example. **[3]**

c) Convert S-R flip - flop to J-K flip - flop. **[3]**

Q5) Answer the following questions.

a) Explain the look ahead carry generator with neat diagram. How it enhances the speed of addition? **[4]**

b) State the importance of HDL for digital system design. **[3]**

c) Explain the ring counter with neat diagram and timing wave form. **[3]**

Q6) Answer the following questions.

a) Distinguish between PLA and PAL. **[4]**

b) Draw the logic diagram for decimal to BCD encoder. Write the verilog code to implement it using behavioral modelling. **[3]**

c) Design the three bit up counter. **[3]**

Q7) Answer the following questions.

a) Enlist the data types in verilog. Explain any two of them in detail with suitable example. **[5]**

b) Explain the architecture of FPGA with neat diagram in complete detail. **[5]**

Q8) Answer the following questions.

a) What is sequential circuit? Explain Mealy and Moore sequential circuit. Compare combinational and sequential circuit. **[5]**

b) Draw the schematic of SRAM cell. Compare the SRAM and DRAM. Why refreshing is required in DRAM? **[5]**

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Total No. of Questions :6]

SEAT No. :

P3130

[Total No. of Pages : 2

[5538]-104
M. Sc. - I
ELECTRONIC SCIENCE
EL1UT - 04 : ADVANCED 'C' PROGRAMMING
(2013 Pattern) (Semester - I) (Credit System)

Time : 2 ½ 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) Write a 'C'-program to convert decimal number to linary number. **[4]**

b) Explain the following functions with suitable ex : **[3]**

i) fgetc ( ) ii) rewind

c) Give comparison between recursion and iteration. **[3]**

Q2) 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]**

Q3) Answer the following :

a) Write a C program to concatanate ture 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]**

Q4) 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]**

Q5) Answer the following :

a) Write a C program using pointers to compute the sum of all elements in are dimensional arry. **[5]**

b) Write a short note an 'Video Adapter and Video Graphics Modes'. **[5]**

Q6) Answer the following :

a) Write a program in C to draw fine wave using graphics H file. **[5]**

b) Write a program to create a file which contains ten integes numbers, and then reads all numbers of this file and separately writes add and even number to another files 'add. dat' & 'even. dat' respectively. **[5]**

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Total No. of Questions : 5]

SEAT No. :

P3119

[Total No. of Pages : 2

[5538]-11

M.Sc. - I

ELECTRONIC SCIENCE

EL1UT01 : Foundation of Semiconductor Devices

(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) Attempt any two of the following : **[2 × 8 = 16]**

a) What are the different methods for semiconductor crystal growth? Explain any one with neat labelled diagram.

b) A Si-sample is doped with 10^{17} as atoms/cm^3. What is the equilibrium hole concentration P_0 at 300K? Where is E_f relative to E_i? Draw resulting bond diagram.

c) Draw and explain hybrid-Pi equivalent circuit of npn BJT in CE configuration.

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

a) State and explain importance of Schrodinger's wave equation in solving bound state potential problems. Explain the quantum mechanical tunneling of an electron.

b) With the help of energy diagram explain qualitatively charge flow in an P-n junction under forward and reverse bias. Obtain expression for electron concentration when junction is forward bias.

c) How JFET is different from MESFET? Explain constructional details of n-channel MESFET.

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

a) Define Fermi-Dirac distribution function. Explain its dependence on temperature.

b) Explain the concept of quasi-Fermi Energy levels for electrons and holes.

c) Explain the formation of Schottky barrier diodes with the help of energy band diagram.

d) What is SCR? Explain I-V characteristics of SCR.

e) Explain the basic MOS capacitor structure. Compare its working with parallel plate capacitor.

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

a) Explain Hall effect. How the n-type or p-type semiconductor samples are identified using Hall voltage?

b) Explain with diagram working of HBT. State its advantages over BJT.

c) Draw simplified cross-section of npn-polysilicon Emitter BJT. Give its special feature over BJT.

d) What is LASER semiconductor diode? Explain how lasing takes place in LASER diode?

e) Draw different basic MOS structure for the case $V_{GS} < V_T$ for V_{DS} takes small, large and saturation values. Explain variation of I_D versus V_{DS} for n-channel depletion mode.

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

a) What is effective mass? If an electron is in the bottom of an allowed energy band, let us assume conduction band in reduced K space is the parabolic approximation, show that m* is positive.

b) "The breakdown voltage of a P-n junction decreases as the doping concentration increases" - Comment.

c) State Poissons equation in terms of charge density and number of charge carriers. Give the importance of this equation in depletion approximation.

d) What is PIN photodiode? Explain its working in brief.

e) Explain imperfections and impurities in solids. How they are effective in characteristics of solid state devices?

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Total No. of Questions : 5]

SEAT No. :

P3120

[Total No. of Pages : 2

[5538]-12

M.Sc. - I

ELECTRONIC SCIENCE

ELIUT02 : Analog Circuit Design and Analysis

(2008 Pattern) (Semester-I) (Credit System)

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

Instructions to the candidates:

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

Q1) Attempt any two:

a) What are important characteristics of instrumentation amplifier? Deduce an expression for its output voltage. **[8]**

b) Draw block diagram op-amp and explain function of each block. **[8]**

c) What is ideal current source? With neat diagram, explain the working of current mirror circuit and Wilson current source. **[8]**

Q2) Attempt any two:

a) What is effect of Non inverting amplifier on its input impedance, output impedance, gain & frequency? **[8]**

b) Obtain inverse laplase transfermation for a given functions.

i) $F(S) = \dfrac{S+5}{S(S^2+2S+5)}$ **[4]**

ii) $F(S) = \dfrac{2}{(S+1)\,(S+5)}$ **[4]**

c) Explain following characteristics of operational amplifier: I/P Bias current, CMRR, I/P offset voltage, slew rate. **[8]**

P.T.O.

Q3) Attempt any two:

a) Explain the working of two op-amp practical log amplifier circuit. **[8]**

b) What is active filter? What are its advantages over passive filter? Design 2^{nd} order low pass filter for cut off frequency 1 KHz and pass band gain 5. **[8]**

c) i) Derive an expression for hybrid parameters. **[4]**

ii) Explain in brief, the response of series RLC circuit for sinusiodal volatge. **[4]**

Q4) Attempt any four of following:

a) Solve & obtain inverse Laplace transformation. **[4]**

$$F(S) = \frac{(5S+4)}{(S-1)\,(S^2+2S+5)}$$

b) Explain the terms: Transfer function, pole and zero of a network. **[4]**

c) Draw a circuit diagram of practical integrator. Give designing steps of it. **[4]**

d) Explain the working of R-2R ladder network with op-amp for Digital to Analog convertor. **[4]**

e) Solve and obtain inverse Laplace transformation. **[4]**

$$F(S) = \frac{S-3}{S^2+4S+13}$$

Q5) Attempt any four of the following:

a) What is peak detector? Explain the working of peak detector circuit using op-amp. **[4]**

b) Explain the working of cascade current source. What is its advantage? **[4]**

c) Explain in brief Band Gap Voltage reference. **[4]**

d) Write a short note on shielding and guarding techniques in op-amp circuits. **[4]**

e) What is need of high power op-amp? Explain the relevent parameters of a typical high power op-amp. **[4]**

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Total No. of Questions : 5]

SEAT No. :

P3121

[Total No. of Pages : 3

[5538]-13
M.Sc.
ELECTRONIC SCIENCE
ELIUT - 03 : Instrumentation and Measurement Techniques
(2008 Pattern) (Semester - I)

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

Instructions to the candidates:

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

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

a) Conformity is necessary but not sufficient condition for precision because of lack of significant figures obtained. Comment with suitable example.

b) Explain dynamic characteristics of measurement system. Give time domain analysis for step input.

c) Give classification of transducers.

d) With neat block diagram of measurement system, explain different element used in it.

e) List the primary sensing elements used for pressure measurement with neat diagram.

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

a) State different types of measurement systems. Describe deflection and null type instruments with suitable examples.

b) Give working principle of LVDT. State advantages and disadvantages of LVDT.

c) State the characteristics of measurement system. Explain loading effect of series connected instrument with suitable example.

d) What are the advantages and limtations of potentiometric transducer used for displacement measurement.

e) Define absolute and relative error. A voltage has true value of 7.5V. An analog voltmeter with scale range of 0-10V shows a reading of 7.35V. What is the value of absolute error and correction? Express the error as a fraction of true value and full scale deflection.

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

a) Give working principle of RTD. A platinum resistance thermometer has a resistance of 100Ω at 25°C. Find its resistance at 60°C. Calculate the temperature, if the resistance is 200Ω.

b) Describe the working principle of capacitive and inductive transducers.

c) What is telemetry? Explain working of general telemetry system with block diagram.

d) Describe different techniques used for magnetic recording. State advantages of FM type of magnetic recording.

e) Draw and explain sound level meter. How it is used for sound pressure level measurement.

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

a) List different types of strain gages. Derive an expression for gage factor of simple wire type strain gage.

b) With neat block diagram explain working of DFM. State different modes of measurement.

c) What is signal conditioning used in measurement system? With block diagram explain AC signal conditioning system.

d) Give working principle of the following:

i) Hot wire anemometer

ii) Thermal conductive gage

e) Draw the circuit diagram for the following and write output equation of them.

i) Voltage follower with gain

ii) Zero crossing detector

iii) Differential amplifier

iv) Inverting amplifier

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

a) A copper - constantan thermocouple have linear calibration between 0 to 500°C with emf at maximum temperature is 40.68mV with reference junction at 20°C.

Determine the correction, which must be made to indicate emf, if cold junction is at 25°C. If the indicated emf is 8.92 mV, determine the temperature of hot junction.

b) Give working principle of McLeod gauge used for pressure measurement. For McLeod gauge with capillary of 1mm diameter and effective bulb volume of 80 cm^3. Find the reading as indicated by mercury column due to pressure of 10 pa.

c) A mild steel shaft is used to connect a motor drive to a constant load torque. To measure this torque, a resistance strain gage of 120Ω and gage factor of 2 is mounted at 45° to the shaft axis. Shear modulus of steel is 80 GPa, shaft diameter is 50mm and change in gage resistance due to load is 0.1Ω. Find the load torque.

d) A piezoelectric crystal has dimensions of 5×5×1.5mm and voltage sensitivity of 0.055 Vm/N. A force is applied to it and it develops a voltage of 100 V. Find the force.

e) What is wave analyser? With the help of block diagram explain the working of Heterodyne wave analyser.

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Total No. of Questions : 8]

SEAT No. :

P3131

[Total No. of Pages : 3

[5538]-201

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT05 : Applied Electromagnetics, Microwaves and Antennas

(2013 Pattern) (Credit System) (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 indicates full marks.***
5) ***Use of non programmable calculator is allowed.***

Q1) Answer the following questions :

a) Starting with Maxwell's curl equations for charge free medium with finite conductivity, obtain wave equations for E and H vectors. **[4]**

b) Find the skin depth at 2 MHz and at 30 GHz for silver.

Given $\sigma = 6.15 \times 10^7$ S/m, $\mu_r = 1.0$ **[3]**

c) Draw field configuration for TM_{21} and TE_{32} mode in rectangular wave guide. **[3]**

Q2) Answer the following questions :

a) Obtain α and β for wave propagating in a good conductor. Comment on the result. **[4]**

b) Explain any three types of transmission lines. **[3]**

c) Explain with neat diagram that how TE_{10} mode is excited in a rectangular waveguide from Co-axial cable. **[3]**

Q3) Answer the following questions :

a) A certain transmission line 2m long operating at W = 10^6 rad/S has $\alpha = 8 \,\mathrm{dB/m}$, β = 1 rad/m and $Z_0 = 60 + i40\,\Omega$. If the line is connected to a source of $10\angle 0^\circ$ V, $Z_g = 40\,\Omega$ and terminated by a load of $Z_L = 20 + i50\,\Omega$ determine : **[4]**

P.T.O.

b) Write a short note on Optical Fiber with reference to following points : **[3]**

i) Types.

ii) Fiber optic system.

iii) Advantages.

c) How can an antenna be used to measure distant temperature? **[3]**

Q4) Answer the following questions :

a) Derive an expression for Retarded Magnetic Vector Potential $\bar{A}$. **[4]**

b) The air filled resonant cavity with dimensions a = 5 cm, b = 4 cm and c = 10 cm of copper ($\sigma_C = 5.8 \times 10^7$ S/m). Find the f_{r101}, f_{r011}, f_{r102} resonant frequencies. **[3]**

c) Write Maxwell's equations in Differential Vector form. **[3]**

Q5) Answer the following questions :

a) In case of two wire transmission line, obtain an expression for reflection coefficient at the receiving end in terms of load impedance and characteristic impedance of transmission line. **[4]**

b) A standard air filled rectangular waveguide with dimensions a = 8.636 cm, b = 4.318 cm, is fed by a 4 GHz carrier from a co-axial cable. Calculate phase velocity for TE_{10} mode. **[3]**

c) Derive Maxwell's First, third and fourth equation. **[3]**

Q6) Answer the following questions :

a) Write a short note on EMI with reference to : **[4]**

i) Types of EMI.

ii) Sources of EMI.

b) Write any three characteristics of Smith-Chart. **[3]**

c) Explain construction and working principle of Optical fibre. **[3]**

Q7) Answer the following questions :

a) Derive an expression for Poynting theorem. Comment on the result. **[5]**

b) Explain Gunn effect diode with reference to **[5]**

i) Construction.

ii) Working principle.

iii) Applications.

Q8) Answer the following questions :

a) Explain in brief following parameters of an antenna : **[5]**

i) Gain.

ii) Directivity.

iii) Aperture.

iv) Radiation pattern.

v) Front to back ratio.

b) Obtain an equation for r-circle in Smith Chart. **[5]**

Total No. of Questions : 8]

SEAT No. :

P3132

[Total No. of Pages : 3

[5538]-202
M.Sc. - I
ELECTRONIC SCIENCE
EL2 UT 06 : Instrumentation and Measurement Techniques
(2013 Course) (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 diagrams must be drawn wherever necessary.***
5) ***Use of non-programmable calculator is allowed.***

Q1) a) Give classification of transducers in detail. **[4]**

b) Explain static error and static correction. A meter reads 127.50 V and true value of voltage is 127.43 V. Determine static error and static correction for this instrument. **[3]**

c) Explain linearity, threshold and dead time of measurement system. **[3]**

Q2) a) Draw the block diagram of generalized instrument system and explain function of each block. **[4]**

b) A linear resistance potentiometer is 50 mm long and is uniformly wound with wire having a resistance of 10 $k\Omega$. Under normal condition, the slider is at the centre of the potentiometer. Find the linear displacement when the resistance of the potentiometer as measured by a wheatstone bridge for two cases.

i) 3850 Ω

ii) 7560 Ω

Are these two displacements are in the same direction? **[3]**

c) Explain the terms -

i) Precision

ii) Accuracy

ii) Repeatability **[3]**

Q3) a) What is output impedence and input impedence of the device? Describe loading effect due to series connected instruments with suitable example. **[4]**

b) Explain the working principle of -

i) Knudsen gauge

ii) Electromagnetic flow meter **[3]**

c) State different types of strain gauges. A resistance wire strain gauge uses a soft iron wire of small diameter. The gauge factor is +4.2. Neglecting the piezo-resistive effect, calculate the poisson's ratio. **[3]**

Q4) a) Derive the equation of time response of 1^{st} order system when subjected to ramp input. The temperature of furnace is increased at a rate of 0.1 $°C$/sec. What is the maximum permissible time constant of 1^{st} order system, when temperature is read with maximum error of 5 $°C$. **[4]**

b) What are different methods of flow measurement? State working principle of ultrasonic flow meter. **[3]**

c) The output of an LVDT is connected to a 10V voltmeter through an amplifier whose amplification factor is 250. An output of 4 mv appears across the terminals of LVDT when the core moves through a distance of 0.5 mm. Calculate the sensitivity of the LVDT and that of the whole set-up. The millivoltmeter scale has 100 divisions. The scale can be read to $1/5^{th}$ of a division. Calculate the resolution of the instrument in mm. **[3]**

Q5) a) Describe the construction and working of resistance thermometer. What are the materials used for RTD's? **[4]**

b) State the types of measurement system. Distinguish between deflection and null type instruments. **[3]**

c) A multimeter having sensitivity of 2000 Ω/v is used for measurement of voltage across the circuit having an output resistace of 10kΩ. The open circuit voltage of a circuit is 6v. Find the reading of multimeter when it is set to 10v scale. Find the percentage error. **[3]**

Q6) a) Explain working principle of optical pyrometer and Infrared pyrometer. **[4]**

b) What are the different displacement transducers? Explain LVDT with circuit diagram. **[3]**

c) State the methods of corrections of instruments and measurement systems. Explain any two. **[3]**

Q7) a) What is thermocouple? State advantages and disadvantages of thermocouple.

A thermocouple circuit uses a Chromel-alumel thermocouple which gives an emf of 33.3v when measuring a temperature of 800 °C with reference temperature °C. The resistance of the meter coil, 'Rm' is 50 Ω and a current of 0.1 mA gives full scale deflection. The resistance of junctions and leads, 'Re' is 12 Ω. Calculate-

i) Resistance of the series resistance if the temperature of 800 °C is to give full scale deflection and

ii) The approximate error due to rise of 1 Ω in 'Re'. **[5]**

b) Derive the expression for time response of second order system when subjected to unit step input. Find the dynamic and steady state error. **[5]**

Q8) a) State working principle of Piezo-electric transducer. Draw the equivalent circuit of it. Describe different modes of operation of Piezo-electric transducer. Describe the properties of materials used for Piezo-electric transducer. **[5]**

b) What is thermistor? Describe their different forms of construction with suitable diagram. Draw resistance - temperature characteristics. Also state their applications. **[5]**

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Total No. of Questions : 6]

SEAT No. :

P3134

[Total No. of Pages : 2

[5538]-204
M.Sc. - I
ELECTRONIC SCIENCE
EL2UT08 : Foundation of Semiconductor Devices
(2013 Pattern) (Credit System) (Semester - II)

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) *Use of non-programmable calculator is allowed.*

Q1) Attempt the following :

a) Explain working principle of PNP transistor with hole and electron flow direction. Derive the expression for emitter injection efficiency. **[4]**

b) Find the resistivity of intrinsic Si at 300 K. Given : $\mu_n = 1350$ and $\mu_p = 480\ cm^2/V\text{-}S$, $n_i = 1.5 \times 10^{10}\ cm^{-3}$. **[3]**

c) What is Hall effect? Derive the expression for mobility of charges. **[3]**

Q2) Attempt the following :

a) A Si sample is doped with 10^{17} As atoms/cm^3. What is the equilibrium hole concentration P_0 at 300K? Draw the resulting band diagram. **[4]**

b) Discuss channel length modulation in N-channel MOSFET. **[3]**

c) Write a short note on imperfect ion in solids. **[3]**

Q3) Attempt the following :

a) Explain the Ebers-Moll model of NPN bipolar junction transistor. **[4]**

b) Comment : 'Electron recombination and generation rate in equilibrium is equal'. **[3]**

c) Explain the concept of density of states? Derive an expression for effective density of states for electrons in the conduction band. **[3]**

P.T.O.

Q4) Attempt the following :

a) Derive the solution for time dependent Schrodinger wave equation for free particle. **[4]**

b) Explain transient response of P-N junction diode. **[3]**

c) Write a short note on polysilicon emitter BJT structure. **[3]**

Q5) Attempt the following :

a) Explain the following terms for FCC structure. **[5]**

i) Atomic radius.

ii) Number of atoms per unit cell.

iii) Packing factor.

b) Obtain the expression for electron and hole diffusion current density in semiconductor. Show the graphically electron hole concentration as a function of distance. **[5]**

Q6) Attempt the following :

a) Explain MOSFET small signal equivalent circuit for low frequency and high frequency. **[5]**

b) Write a short note on VPE and MBE method for crystal growth. **[5]**

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Total No. of Questions : 5]

SEAT No. :

P3122

[Total No. of Pages : 2

[5538]-21

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT04 : Applied Electromagnetics RF & Microwave

(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicates full marks.***

Q1) Attempt any two of the following : **[2 × 8 = 16]**

a) Explain with suitable examples, the electromagnetic effect in high speed digital system.

b) How antenna are classified? Discuss rectangular, Horn antenna and Yagi-Uda antenna with special reference to its directivity, bandwidth and field pattern.

c) With necessary diagram, explain the principle construction and working of magnetron.

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

a) Define voltage standing wave ratio. Obtain the relations for Voltage reflection coefficient and transmission coefficient for a transmission line.

b) What is skin depth? Derive the expression for the same. The attenuation constant of a medium for a certain plane wave is 0.3 N p/m, find its skin depth.

c) What do you mean by retarded potential, explain it? Explain Lorentz gauge and coulomb gauge condition.

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

a) Distinguish between twisted pair, co-axial and optical transmission line.

b) What is RF heating? Why it is called clean heating system?

c) State Maxwell's equation in differential form. Solve them to obtain wave equation for E and H vector.

d) Explain the working principle of fiber optical waveguide.

e) Define Directive gain and directivity of an antenna.

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

a) Explain working principle of Gunn diode.

b) Explain in brief EMI and EMC.

c) Define term SWR of a transmission line. How it is related with reflection coefficient?

d) Describe how antenna arrays can be used to generate large number of radiation patterns by proper source spacing and phases.

e) What are the application of klystron? Explain its working.

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

a) Explain TE and TM excitation mode of rectangular wave guide.

b) What is EMI shielding? Why it is required?

c) Write a note on Aperture antenna.

d) With the help of energy band diagram, explain working principle of tunnel diode.

e) How is bunching achieved in a cavity magnetron?

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Total No. of Questions : 5]

P3123

SEAT No. :

[Total No. of Pages : 2

[5538]-22

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT 05 : Communication Electronics

(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

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

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

a) Draw the SDLC basic frame format and explain the function of each field in short.

b) What are the basic continuous time signals? Draw any four waveforms and write their equation.

c) Draw neat diagram of any one method of neutralization and explain it in short.

d) With the help of diagram, explain the working of delta modulator.

e) What is ISDN? Write the features of ISDN services.

f) With the help of circuit diagram, explain the working of transistor amplitude modulator.

Q2) Answer any two of the following. **[2×8=16]**

a) Explain superheterodyne action. With a neat block diagram explain the working of AM receiver. What is the need of AGC?

b) Draw the diagram of single tuned RF amplifier and explain the circuit operation. Also derive the expression for its frequency of oscillation.

c) With the help of block diagram, explain the working of amplitude shift keying and frequency shift keying digital modulation techniques in detail.

Q3) Answer any four of the following. **[4×4=16]**

a) Describe internal and external noise in short.

b) With the help of block diagram, explain the working of single side band generation using phase shift method.

c) Explain the working of wide band amplifier and write its applications.

d) What is companding? Write its advantages in communication system.

e) Draw and explain block diagram of data communication system.

f) Explain Bluetooth technology in short.

Q4) Answer any two of the following. **[2×8=16]**

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

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

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

Q5) Answer any four of the following. **[4×4=16]**

a) Explain any one data compression technique in detail. Write the advantages of it in communication.

b) The equation for FM wave is

$e_{FM} = 10 \sin (8 \times 10^8 t + 4 \sin 1500 t)$

Find carrier frequency, modulating frequency, modulation index (mf) and maximum deviation Δf. What power will this FM wave dissipate in a 10Ω resistive load.

c) Explain working of synchronous stagger tuning in short.

d) Explain any one code error detection technique.

e) With reference to satellite communication, explain the following terms:

i) Up-link

ii) Down-link

iii) Cross link

iv) Propagation delay.

f) Describe any one type of digital subscriber line (DSL) in detail.

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Total No. of Questions : 8]

SEAT No. :

P3135

[Total No. of Pages : 2

[5538]-301

M.Sc. - II

ELECTRONIC SCIENCE

EL3UT09 : Communication Electronics

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

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 frame format of HDLC and explain the function of each field in brief. **[4]**

b) With the help of block diagram explain the working of single sideband AM generation using phase shift method. **[3]**

c) Describe switch beam smart antenna system in short. **[3]**

Q2) a) Describe the sky wave propagation with the help of diagram. **[4]**

b) Draw the circuit diagram of varactor diode FM generator and explain it's working. **[3]**

c) Write the mathematical analysis of amplitude modulation and comment on bandwidth of signal. **[3]**

Q3) a) State the principle of superheterodyne technique in radio receiver with suitable diagram. Explain the role of mixer in it. **[4]**

b) Explain the working of single sided PAM. **[3]**

c) With the help of neat diagram, explain cellular telephone system. **[3]**

Q4) a) With the help of block diagram, explain the working of FDM transmitter in short. **[4]**

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

c) With reference to bluetooth technology, explain the terms : **[3]**

i) ISM band.

ii) Piconet.

iii) Scatternet.

Q5) a) With the help of circuit diagram, explain the working of diode detector used for AM signal. **[4]**

b) Draw the diagram of broadside array antenna. Explain its working in brief. **[3]**

c) With the help of block diagram, explain the working of Infrared Data Association (IrDA) module. **[3]**

Q6) a) Draw the block diagram of adaptive delta modulation. Explain its working in short. Write the advantages of it over delta modulation. **[4]**

b) With the help of diagram, explain the construction and working of Yagi-uda antenna. **[3]**

c) Describe any two applications of geostationary satellite in short. **[3]**

Q7) a) Draw the block diagram of public switch telephone network (PSTN) and describe it in short. **[4]**

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

c) Calculate the r.m.s. noise voltage appearing across 10 KΩ at room temp 27ºC for an effective bandwidth of 15 KHz. **[3]**

Q8) a) What is an antenna coupler? Describe the functions of it. **[4]**

b) With the help of diagram, explain the working of 16-QAM in short. **[3]**

c) Equation for FM wave is **[3]**

$e = 12 \sin(8 \times 10^8 t + 5 \sin 1700t)$

Find the carrier frequency, modulating frequency, modulation index and maximum deviation.

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Total No. of Questions : 8]

SEAT No. :

P3125

[Total No. of Pages : 2

[5538]-31

M.Sc. - II

ELECTRONIC SCIENCE

EL3UT05 : Embedded Systems

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

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

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

a) Explain in circuit emulator and debugger.

b) Distinguish between microprocessor and microcontroller.

c) Draw the block diagram of 8051 μC and name each block.

d) List any four features of PIC16F877A microcontroller.

e) Explain addressing modes of AVR microcontroller with suitable example.

Q2) Attempt any four of the following : **[4 × 4 = 16]**

a) Explain memory map of 8051 microcontroller.

b) Explain SPI communication standard in details.

c) Explain ADC registers in AVR microcontroller.

d) Explain how PWM is generated in P/C microcontroller.

e) Write an assembly / C, Program to continueously ON and OFF LED's connected to PORTI of 8051 microcontroller.

Q3) Attempt any two of the following : **[2 × 8 = 16]**

a) With the help of diagram explain architecture of AVR.

b) Explain development cycle of embedded system design.

c) Explain timer/counter modes of 8051 microcontroller in details.

P.T.O.

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

a) Draw interfacing diagram of DC motor to 8051, Write C program to rotate it anticlockwise.

b) Explain different PORT register of AVR μC.

c) Explain how to load hex file in flash memory of 8051 microcontroller.

d) Explain 12C protocol in detail.

e) Write an assembly / C program for PIC microcontroller to generate square and triangular waves.

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

a) i) Write C program to generate square wave with 75% duty cycle using CTC mode of AVR timer 0.

ii) Write C program to toggle LSB bit of PORTA of AVR.

b) With the help of schematic diagram explain target board of 8051 microcontroller. List various components used in designing.

c) Draw the interface diagram of LCD to PIC microcontroller and write a 'C' program to display "M.Sc. Electronics" on second line of LCD.

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Total No. of Questions : 8]

SEAT No. :

P3136

[Total No. of Pages : 2

[5538]-401

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) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right side indicates full marks.*
5) *Use of non programmable calculator is allowed.*

Q1) Answer the following :

a) Explain the concept of feedback control. Describe various elements used in control system. **[4]**

b) Explain canonical form of block diagram for a closed loop system. Derive its transfer function. **[3]**

c) What is meant by process load and process lag. **[3]**

Q2) Answer the following :

a) Write a short note on solenoids. **[4]**

b) Explain critical rules of block diagram reduction. **[3]**

c) Comment : 'Integral mode cannot be used alone'. **[3]**

Q3) Answer the following :

a) How is stability predicted from Bode plots? Define gain and phase margins. **[4]**

b) Distinguish between continuous control and discrete state process control. **[3]**

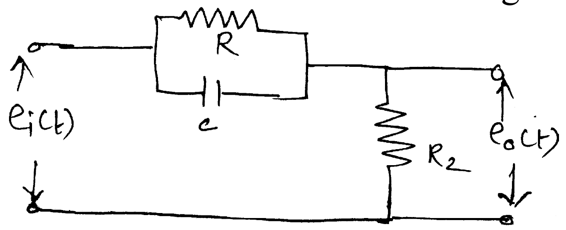
c) Write a short note on standard graphics symbols used in process control system. **[3]**

P.T.O.

Q4) Answer the following :

a) With neat diagram and equations, explain the working of PID controller. **[4]**

b) Obtain the transfer function of following network. **[3]**



c) Write short note on recorder. **[3]**

Q5) Answer the following :

a) Compare the performance of PI, PD and PID controller. **[4]**

b) Explain three position analog control systems. **[3]**

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

Q6) Answer the following :

a) State advantages and disadvantages of Myquist plot. **[4]**

b) Write a short note on position control system. **[3]**

c) Using Routh-Hurwitz criteria determine stability of the system having denominator polynomial. **[3]**

$D(S) = S^4 + 2S^3 + 8S^2 + 4S + 3 = 0$

Q7) Answer the following :

a) Write short note on DCS in detail. **[5]**

b) The transfer function of a system is given by **[5]**

$$T(S) = \frac{K(S+6)}{S(S+2)(S+5)(S^2+7S+12)}.$$

Determine :

i) Poles.

ii) Zeros.

iii) Characteristic equation.

iv) Pole-zero plot in S-plane.

Q8) Answer the following :

a) Explain open loop transient response method for process loop tuning. **[5]**

b) With suitable example, explain the concept of block diagram of control system. State its advantages and limitations. **[5]**

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Total No. of Questions : 5]

SEAT No. :

P3126

[Total No. of Pages : 2

[5538]-41

M.Sc. - II

ELECTRONIC SCIENCE

EL4UT-06 : Control Systems : Theory and Applications

(2008 Pattern) (Semester - IV)

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

Instructions to the candidates:

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

Q1) Solve any two of the following : **[2 × 8 = 16]**

a) Explain the concept of feedback control. Discuss various elements used in feedback control system. What are the advantages of feedback in feedback control system?

b) How offset error is removed in I controller? Write features of proportional and integral control modes. Give a circuit for PID controller and write its output equation.

c) Explain Zeigler - Nichols method for process loop tuning. What is Bode plot?

Q2) Solve any two of the following : **[2 × 8 = 16]**

a) With suitable examples write difference between

i) Feedback control system and feed forward control system.

ii) Open loop system and closed loop system.

b) With neat diagram explain PLC system memory. How is PLC application memory organized into various files?

c) Define ladder diagram. State advantage of ladder diagram. Construct ladder diagram for bottling plant control with its event sequence.

Q3) Solve any two of the following : **[2 × 8 = 16]**

a) What is the roll of input and output status file in PLC? Discuss input output interaction with input and output status file in a PLC.

b) i) What is root locus? Explain angle and magnitude conditions for a point to be on the root locus.

ii) Write a difference between conventional ladder and PLC ladder logic.

c) i) Write a note on solenoid value. Give its applications.

ii) Explain in brief annunciator.

Q4) Solve any four of the following : **[4 × 4 = 16]**

a) Define transfer function. Write the procedure for obtaining transfer function of a Control System.

b) Distinguish smart and dumb programming terminals.

c) How watchdog time used in PLC operation?

d) Explain special cases of Routh's criteria.

e) The transfer function of a system is given by -

$$T(S)=\frac{K(S+6)}{S(S+2)(S+5)(S^2+7S+12)}$$

Determine :

i) Poles.

ii) Zeros.

iii) Characteristic equation.

iv) Pole-zero plot in S-plane.

Q5) Solve any four of the following : **[4 × 4 = 16]**

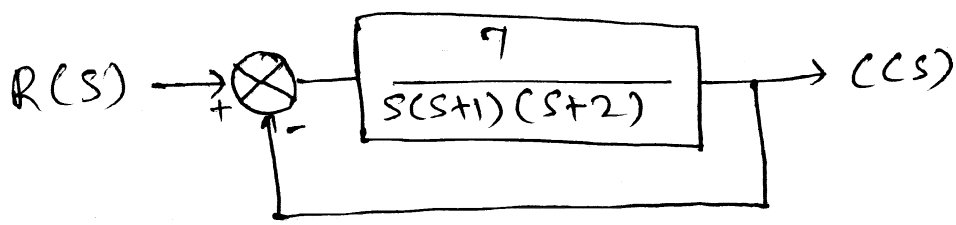
a) Explain Retentive timer instruction.

b) Write a note on PLC countdown instruction.

c) Explain PLC processor. Write selection criteria to select a correct PLC processor for an application.

d) Explain concept of stability. Write any two disadvantages of the Hurwitz criterion.

e) Check whether the following system is stable or unstable using below diagram.



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