Total No. of Questions : 5]

SEAT No. :

P550

[Total No. of Pages : 2

[4236] - 101

M.Sc.

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 diagrams wherever necessary.***
4) ***Use of non-programmable calculator is allowed.***

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

a) Explain how and why energy bands are formed in a solid crystal. Discuss importance of forbidden energy bands.

b) What is Hall effect? Explain an experimental set up for Hall effect and obtain relation for Hall voltage. How hole mobility and electron mobility is obtained by this experiment.

c) Describe qualitatively charge flow in a p-n junction with zero bias, reverse bias and forward bias conditions. Draw the necessary energy band diagrams.

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

a) State the advantages of using equivalent circuit model for BJT analysis. Explain Ebers-Moll model for BJT device. Draw and explain its equivalent circuit in detail.

b) What are advantages of MOSFETs over JFETs? Explain the small dimension effects with respect to threshold voltage and width.

c) List frequency limitation factors in the MOSFET. Derive relation for cutoff frequency in an ideal case.

P.T.O.

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

a) What are space lattices? Discuss unit cell and primitive cell.

b) Calculate Quasi Fermi levels for electrons and holes.

c) "The breakdown voltage of a p-n junction decreases as the doping concentration increases", comment.

d) Explain with diagram working of SCR. Draw I-V characteristics and discuss various switching terms from it

e) Discuss ideal CV characteristics of MOSFET.

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

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

b) What is effective mass? State its importance in semiconductor technology.

c) Write short note on Gunn diode.

d) Differentiate between HBT and BJT.

e) What is MESFET? State its applications in electronics and explain any one in brief.

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

a) Show that packing factor or density of packing for simple cubic structure is 52%.

b) Calculate the collector-emitter saturation voltage of a bipolar transistor at T = 300K. (Consider $\alpha_F = 0.99$, $\alpha_R = 0.20$, $I_C = 1mA$ and $I_B = 50\mu A$)

c) Discuss spice models for MOSFET.

d) List non ideal effects in JFET. Explain any one in detail.

e) Write short note on epitaxial growth method to develop pure crystal.

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Total No. of Questions : 5]

SEAT No. :

P551

[Total No. of Pages : 3

[4236] - 102

M.Sc.

ELECTRONIC SCIENCE

EL1 - UT02 : Analog Circuit Design and Analysis

(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) ***Use of logtable non-programmable calculator is allowed.***
4) ***Draw neat diagrams wherever necessary.***

Q1) Solve any <u>two</u> :

a) Explain following op-amp characteristics and their significance in circuit design.

- Input and output impedance.
- Open-loop frequency response.
- CMRR
- Slew rate. **[8]**

b) Explain the following terms giving suitable examples.

- Complex frequency and complex plane
- Transfer function
- Poles and zeroes
- Dominant pole **[8]**

c) i) Obtain Laplace transform of following signals.

- Exponential voltage e^{-at}
- Sin wt and cos wt **[4]**

ii) Design a single op-amp circuit to obtain

$$e_0 = (e_1 + e_2) - (e_3 + e_4)$$

Where e_1, e_2, e_3 and e_4 are input signals. **[4]**

P.T.O.

Q2) Solve any <u>two</u> :

a) i) What are the applications of constant current source? Explain current mirror circuit. Comment on errors involved in its performance. **[4]**

ii) Explain concept of active load. What is its advantage? **[4]**

b) Explain device mismatch effects in differential amplifiers. **[8]**

c) i) Design an inverting amplifier with gain –10. It must have an input impedance of 15 kΩ. How would you estimate its offset error? **[4]**

ii) Design an instrumentation amplifier using 3 op-amps to obtain a gain of 105. **[4]**

Q3) Solve any <u>two</u> :

a) i) State Nyquist criterian for stability. How can a Nyquist diagram be used to check stability of a feedback amplifier? **[4]**

ii) Compare the performance of inverting and non-inverting amplifiers regarding the following. **[4]**

- Feed back connection
- Gain
- Common mode errors
- Input impedance

b) Explain the working of a two op-amp, practical log amplifier circuit. Obtain necessary equation. How does it achieve temperature compensation? **[8]**

c) i) Design a second order Butterworth LPF for cutoff frequency of 1KHz. **[4]**

ii) What is supply independent biasing? How can it be achieved? **[4]**

Q4) Solve any <u>two</u> :

a) i) Explain the causes of instability in op-amp circuits. What are internally and externally frequency compensated op–amps. **[4]**

ii) Using just one op-amp powered from ± 15V power supply, design circuits to produce $V_o = (10V_I + 2)$ volt and $V_o = [10 (V_2 – V_1) – 4]$ volt. **[4]**

b) i) Explain applications for power op-amp. Give the working and relevant parameters of a typical power op-amp. **[4]**

ii) Explain dual polarity output current booster circuit for a general purpose op-amp. **[4]**

c) i) Discuss shielding and guarding methods used in low current/ low voltage processing amplifiers. **[4]**

ii) Write a short note on micro power design techniques. **[4]**

Q5) Solve any <u>four</u> :

a) Explain potentiometric DAC. **[4]**

b) Explain a $\Sigma - \Delta$ converter. **[4]**

c) Explain giving necessary equations working of source coupled JFET pair. **[4]**

d) Compare performance of different types of ADCs. **[4]**

e) Explain applications of DAC. **[4]**

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Total No. of Questions : 5]

SEAT No. :

P554

[Total No. of Pages : 2

[4236] - 202

M.Sc.

ELECTRONIC SCIENCE

EL2UT05 : 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) Describe a typical data communication link with special reference to DTE and DCE.

b) With the help of suitable diagram, explain the working principle of phase shift keying.

c) Write the advantages of FM over Am.

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

e) Explain the terms: thermal noise and noise voltage.

f) Draw and explain the working of any one method of neutralization.

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

a) i) Describe the importance of time and frequency domains in design and analysis of communication systems.

ii) Draw the block diagram of radio receiver and explain the terms sensitivity and selectivity.

b) i) With the help of circuit diagram, explain the working of varactor diode modulator.

ii) Draw and explain the working of Am diode detector. Write its advantages and disadvantages.

c) i) Explain synchronous stagger tunning. Write its advantages.

ii) Write the advantages of FET RF amplifier used in superheterodyne receiver over BJT.

P.T.O.

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

a) Explain the working of slope detector or foster-seely discriminator.

b) Draw and explain the working of RF tuned amplifier.

c) Describe any two digital signal encoding formats in short.

d) Draw the basic format of XMODEM and explain the function of each field in short.

e) Write short note on very small aperture terminal (VSAT).

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

a) Write the advantages of TDM over FDM. With the help of block diagram, explain the working of TDM.

b) What is QAM? With the help of diagram, explain the working of 16QAM.

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

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

a) With the help of circuit diagram, explain the working of balanced ring modulator.

b) With reference to pulse code modulation (PCM), explain the terms sampling frequency and Quantization.

c) Describe any one code error detection techniques in detail.

d) With the help of block diagram, explain the working of frequency shift keying (FSK) modulator.

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

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Total No. of Questions : 5]

SEAT No. :

P555

[Total No. of Pages : 2

[4236] - 203

M.Sc. - I

ELECTRONIC SCIENCE

EL2UT06 : Digital System Design Using VHDL

(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) ***Neat diagrams must be drawn wherever necessary.***

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

a) With suitable examples explain use clause and library declaration used in VHDL. List the packages of the library IEEE. Explain any two in brief.

b) Explain design flow for digital system design using VHDL.

c) i) Write VHDL code for non-inverting three state buffer.

ii) Write a procedure bcd-ssd for BCD to SSD conversion in VHDL for common anode type of seven segment display.

Q2) Attempt any <u>four</u> of the following : **[4 × 5 = 20]**

a) Design BCD adder to add two one digit BCD numbers using 4-bit parallel adders.

b) Design 3-bit binary to gray code converter using logic gates.

c) Design 8-key keyboard encoder with latching facility.

d) Explain how look ahead carry speed up addition in 4-bit parallel adder.

e) Write VHDL code for 3 to 8 decoder using case statement.

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

a) Write excitation tables for J-k, T flip-flops. Design synchronous counter for the sequence 1-3-5-7-1 using T flip-flops.

b) What is FSM? Explain difference between mealy and moore machine. Write VHDL code for mod - 7 counter using FSM.

c) Write VHDL code for traffic light controller.

P.T.O.

Q4) Attempt any <u>two</u> of the following : **[2 × 6 = 12]**

a) Explain with block diagram bus organisation of processor.

b) Write the comparision of PLA and PAL. What do you mean by GAL ? Implement the following using PLA.

$F1 (A, B, C) = \Sigma m (4, 5, 7)$

$F2 (A, B, C) = \Sigma m (3, 5, 7)$

c) Write a VHDL code for 4-bit ALU to perform arithmatic operations such as addition, subtraction, increment, decrement and logical operations such as AND, OR, XOR, NOT.

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

a) Explain in short ROM with reference to types, data storage principle, control inputs and applications.

b) Draw basic memory cell of DRAM. Explain how data is stored in DRAM. Compare DRAM and SRAM.

c) Explain the architecture of CPLD. Write differences between CPLD and FPGA.

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Total No. of Questions : 5]

SEAT No. : ____

P556

[Total No. of Pages : 2

[4236] - 301

M.Sc. - II

ELECTRONIC SCIENCE

EL3 UT05 : Embedded Systems

(2008 Pattern) (Sem. - III)

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) Attempt any <u>two</u> of the following : **[2 × 8 = 16]**

a) Draw programming model of 8051 showing different registers without their addresses. Explain TCON and PSW registers of 8051.

b) State the features of I^2C bus and explain with waveforms following conditions.

i) Start ii) Stop iii) ACK

Explain data format used in I^2C bus standard.

c) Write a program in C for single digit decimal calculator for addition and subtraction. Read input from keyboard and display result on LCD. (8051 microcontroller)

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

a) Write function of $\overline{EA}$ and ALE pins of 8051. Draw and explain the circuit for interfacing of external 8k × 8bit EPROM and 8k × 8bit RAM to 8051 using suitable 3:8 decoder. Show all control lines and memory map.

b) Draw schematic diagram of 8051 based target board with serial port interface to computer. List the components required to design target board. Explain how you will test crystal and ports. Explain reset circuit used in 8051 based system.

c) Draw circuit diagram to interface two stepper motors to port 1 of 8051. Write C program to rotate stepper motors one in clockwise and other in anticlockwise direction continuously.

P.T.O.

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

a) Explain with flow diagram development cycle in development of microcontroller based product. Explain any two software development tools.

b) List different Integrated Development Environments used in development of 8051, AVR, PIC microcontroller based system. Explain different hardware development tools.

c) Explain how 8051 can be used to measure frequency. Write C program for frequency measurement using 8051.

Q4) a) With neat block diagram explain PWM operation of CCP module of PIC microcontroller. List SFRs involved in PWM generation. What data should be loaded in it to get 20 kHz PWM output with 60% duty cycle. Use oscillator frequency = 20 MHz. **[8]**

b) Attempt any <u>two</u> : **[2 × 4 = 8]**

i) Write C program to implement ON/OFF controller using ADC of PIC microcontroller.

ii) Draw an interfacing of LCD to PORT A of PIC microcontroller. Write C program to display "Electronics" on LCD. (Use LCD in 4-bit mode).

iii) Write C program for blinking of LED connected to PO.O of 8051. Use timer 1 interrupt for one second delay generation.

Q5) a) Explain with neat diagram ADC module and associated registers of AVR. **[8]**

b) Attempt any <u>two</u> : **[2 × 4 = 8]**

i) Write C program to generate 2kHz square wave with 50% duty cycle using CTC mode of AVR timer 0.

ii) Write C program to read key from 4 × 4 keyboard and display it on LEDs connected to PORT A of AVR microcontroller.

iii) Write embedded C statement/s to

I) Clear P1.0 of 8051 using shift operator.

II) Set P1.1 of 8051 using shift operator.

III) Configure timer 0 in mode 1 as timer, and timer 1 in mode 2 as counter. (8051 microcontroller).

IV) Enable external interrupt INTO of 8051 and set it to highest priority.

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Total No. of Questions : 5] **SEAT No. :**

P552 **[Total No. of Pages : 3**

[4236] - 103

M.Sc.

ELECTRONIC SCIENCE

EL1 UT03 : Instrumentation and Measurement Techniques (2008 Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) a) Answer any two : **[2 × 6 = 12]**

i) What is an LVDT and what is its use? Draw the equivalent circuit and show that the output voltage is $e_o = (M_1 - M_2)\frac{dip}{dt}$, where M_1 & M_2 are mutual inductances & i_p is primary current. Why is null reduction circuit required with LVDT ? Draw any one circuit for null reduction.

ii) With the necessary schematic diagram explain the principle and working of electromagnetic flow meter. What are its advantages and disadvantages?

iii) Draw a neat diagram of wheatstone's bridge. Derive the expression for bridge sensitivity in case of the above bridge having equal arms.

b) Answer any one : **[1 × 4 = 4]**

i) With the help of neat diagram explain the working of 3op - amp instrumentation amplifier and write the equation for its output.

ii) What are the different types of land line telemetry systems? Explain any one of them.

P.T.O.

Q2) a) Answer any two : **[2 × 6 = 12]**

i) What are strain gauges and what are their different types (at least 4) ? Write a note on each type of strain gauge giving their constructional features and advantages.

ii) How can a synchro pair be used to generate an error voltage which is proportional to error in angle of rotors of transmitter and control transformer. Write the necessary equations.

iii) What are the different types of measurement errors. Write note on each type of error, mentioning the causes for the errors.

b) Answer any one : **[1 × 4 = 4]**

i) With a block diagram, explain the elements of a 'generalised measurement system'.

ii) Define the following characteristics of a measurement system: true value, static correction, precision, accuracy.

Q3) a) Answer any two : **[2 × 6 = 12]**

i) What are thermistors? How are different types of thermistors made? Write the Resistance - Temperature characteristic equation of thermistor and explain the terms. Give any two important features of thermistors.

ii) With a neat schematic diagram explain the working of V to F converter. State the applications of V to F converter.

iii) Describe the Radio-Line telemetry system. An AM transmitter transmits at its frequency of 880 kHz. Its carrier is modulated by a 3.5 kHz sine wave. What are the transmitted frequencies?

b) Answer any one : **[1 × 4 = 4]**

i) Draw the block diagram of a DFM and explain its working.

ii) With the help of block diagram explain the working of x - t recorder.

Q4) a) Answer any two : **[2 × 6 = 12]**

i) Explain TDM and FDM as applied to telemetry. What is a modem?

ii) A first order instrument must measure signals with frequency up to 100 Hz with acceptable inaccuracy of 5%. What is the maximum allowable time constant ? What will be the shift at 50 Hz & 100 Hz ?

iii) How will you use capacitive transducer to measure small rotary/ angular displacements?

A parallel plate capacitive transducer has plates of area 500 mm^2 which are 0.2 mm apart. Dielectric is air (permittivity is 8.85×10^{-12} F/M) Calculate its capacitance. What will be the change in capacitance if the distance between the plates reduces by 0.02 mm? Calculate the ratio of change in capacitance to per unit change in distance.

b) Answer any one : **[1 × 4 = 4]**

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

ii) Design a RC low pass filter so that output voltage is attenuated by 3 dB at 50 Hz. Calculate time constant and suitable values of R and C.

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

a) An analogue voltage signal whose highest significant frequency is 1 kHz is to be digitally coded with resolution of 0.01% covering the range of 0 - 10V. Determine

i) the minimum number of bits in the digital code

ii) analogue value of LSB.

b) Describe the advantages of digital indicating instruments over analogue type.

c) Write a short note on DSO giving their main features in comparison with analogue CROS.

d) Describe the direct method of tape recording with a functional block diagram of tape recorder/reproducer.

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

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Total No. of Questions : 5]

P552 **[Total No. of Pages : 3**

[4236] - 103
M.Sc.
ELECTRONIC SCIENCE
EL1U0T01 : Network Analysis & Synthesis
(2004 Pattern) (Semester - I)

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

Instructions to the candidates:

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

Q1) Solve any four : **[4 × 4 = 16]**

a) Explain Star-Delta conversion theorem.

b) Give synthesis of the LC driving point impedence $Z(S) = \frac{s^4 + 10s^2 + 9}{s^3 + 4s}$

c) Design a constant K-filter to pass frequencies both 2000Hz to 5000Hz and with a design impedence of 1000Ω

d) Define Incidence matrix, Reduced incidence matrix by taking suitable example.

e) Write a short note on polyphase circuit.

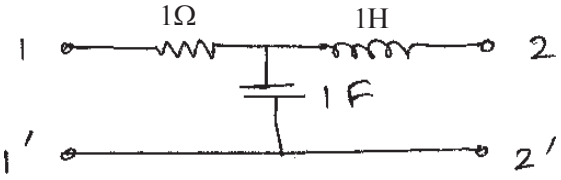
Q2) Solve any four : **[4 × 4 = 16]**

a) Using final value theorem obtain in time domain final value for $F(S) = \frac{2}{s} - \frac{i}{s+3}$

b) Calculate desired turn ratio for an ideal transformer in an amplifier with o/p impedence 1936 Ω is to feed a loud speaker with impedence 4Ω. An r.m.s. current of 20 mA at 500Hz is flowing in primary calculate current and power at secondary.

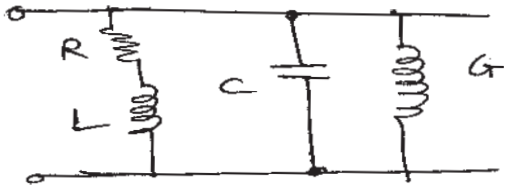
P.T.O.

c) Find Z parameters



d) Find R, L, C and G in the following circuit while impedence

$$z(s) = 10^4 \frac{(s+1)}{(s+1+j100)(s+1-j100)}$$

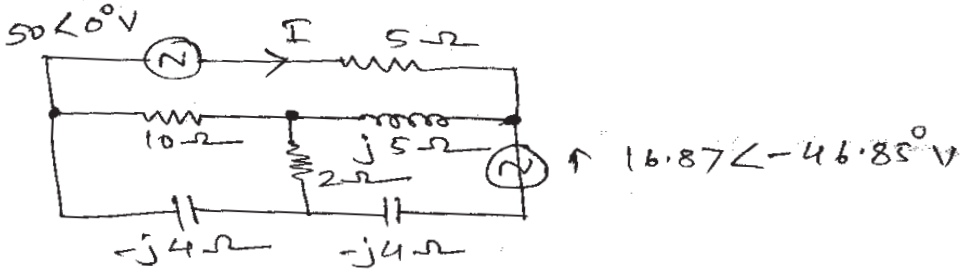


e) Design m derived HPF with a cutoff freq10kHz, impedence 1000Ω and m = 0.4

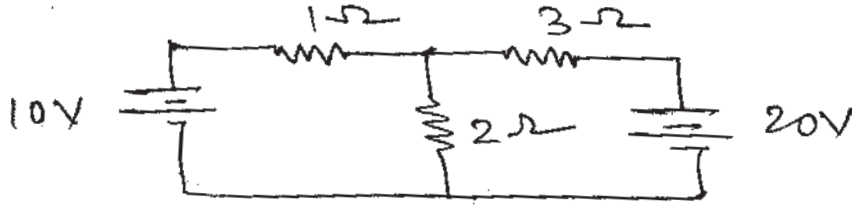
Q3) Solve any four **:** **[4 × 4 = 16]**

a) The given system oscillates with frequency 2rad / sec. Find values of 'kmarginal' and 'P' no of poles in $G(s) = \frac{k(s+1)}{s^3 + ps^2 + 2s + 1}$

b) Find current I using superposition theorem.



c) Verify Tellegen's theorem for the circuit .

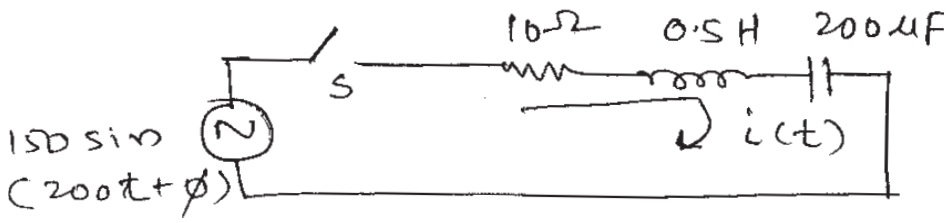


d) State and explain Miliman's theorem with suitable example.

e) Define Laplance transformation and state the condition for its convergence

Q4) Solve any two : **[2 × 8 = 16]**

a) When switch S is closed at $\phi = 30^{o}$ determine the current.



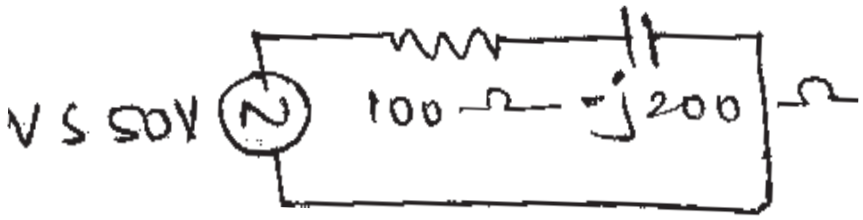
b) Give quantitative sin steady state analysis for purely resistive and capacitive circuit.

c) Find time domain response for transfer function

$$y(s) = \frac{10s}{[(s+5+j15)\ (s+5-j15)]}$$

Q5) Solve any two : **[2 × 8 = 16]**

a) Determine power factor, true power, reactive power and appearent power in the circuit



b) Explain time varient property and determine whether following system is time variant or not T [x (n)] = $e^{x(n)}$

c) What are attenuators, Derive the design equation for T attenuator. Hence design T-type attenuator to give attenuation of 50dB and to operate in line resistance 600Ω.

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Total No. of Questions : 5]

P552 **[Total No. of Pages : 2**

[4236] - 103
M.Sc.
ELECTRONIC SCIENCE
EL1 U0T02 : Optoelectronics
(2004 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 diagrams wherever necessary.***

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

a) State different types of lasers. State advantage of laser as light source.

b) Explain with neat diagram, working principle of PIN photodetector.

c) What is meant by modal dispersion? In which type of fiber it is less? Why?

d) Calculate the efficiency of PIN silicon. Photodetector if the responsivity is 0.58 A/W at 800 nm.

e) Explain chemical deposition method of manufacturing of optical fibers.

Q2) Answer any two : **[2 × 8 = 16]**

a) i) Discuss the wave guide action of graded index optical fiber.

ii) Discuss attenuation spectra for these fibers.

b) Draw and explain the typical experimental arrangement for the measurement of spectral loss in optical fibers. Using cut-back technique.

c) Using simple ray diagram explain the mechanism for transmission of light within an optical fiber. Briefly discuss with neat diagrams what is meant by :

i) Acceptance angle

ii) Numerical Aperture, for an optical fiber.

P.T.O.

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

a) Explain different applications of optical fibers.

b) Explain the term 'splicing' in optical fibers.

c) A step index fiber has V = 26.6 at a 1300 nm wavelength. If core radius is 25 micrometer find numerical aperture.

d) Write a note on NRZS optical fibers.

e) If the radiative and nonradiative time period of LED are 24 ns & 50 ns respectively calculate the internal quantum efficiency.

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

a) Explain with the help of neat diagram the construction and working of LED.

b) Define following terms for photodetectors:

i) Dark current ii) Spectral response

iii) Quantum efficiency iv) Frequency response

c) Draw diagram and explain working of the surface emitting LED – Burrus typ.

d) Discuss the need of monochromatic source in optical fiber communication.

e) The output of a single mode semiconductor laser with RIN value of 10^{-15} dB/Hz is incident directly on an optical detector which has a bandwidth of 100 MHz. The device is emitting at a wavelength of 1.55 μm, at which the detector has quantum efficiency of 60% If the mean optical power incident on the detector is 2 mw, determine'.

i) The rms value of the power fluctuation

ii) The rms noise current at the output of the detector.

Q5) Answer any two : **[2 × 8 = 16]**

a) Describe the two processes by which light can be emitted from an atom. Discuss the requirement for population inversion in order to achieve stimulated emission that may dominate over spontaneous emission. Illustrate with energy level diagram of a common non-semiconductor laser.

b) Explain typical structure of a glass multimode step index fiber. State the bandwidth of the same.

c) Explain two simple techniques used for the measurement of the numerical aperture of optical fiber.

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Total No. of Questions : 5]

SEAT No. :

P553

[Total No. of Pages : 3

[4236] - 201

M.Sc. - I

ELECTRONIC SCIENCE

EL2 UT04 : Applied Electromagnetics, RF & Microwaves

(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 necessary diagrams wherever necessary.***
4) ***Use of log-tables / electronic calculators (non-programmable) is allowed.***

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

a) With the help of suitable diagrams and Maxwell's equations, obtain the boundry conditions between two different materials.

b) Draw the schematic diagram of elementary section of transmission line with parameters R, C, L and G. Obtain the transmission line equations in voltage form and current form. What is the characteristic impedance of the line?

c) What are the basic elementary antenna types? Explain the following:

(i) antenna patterns

(ii) radiation intensity

(iii) directive gain

(iv) power gain

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

a) A distortion-less line has characteristic impedance of 50 ohms, attenuation constant of 20 mNp/m and wave velocity of 0.7c, where c is velocity of light in vacuum. Find R, L, G and C at 100 MHz.

b) What is Gunn effect ? Draw the typical J-V characteristics of Gunn diode. Explain the phenomenon of negative resistance characteristics. Describe different modes of operation of Gunn diode.

P.T.O.

c) An electric field strength of 5μV/m is to be obtained at an observation point $\theta = \frac{\pi}{2}$, 100 km from a half wave (resonant) dipole antenna operating at 100 MHz in air. Find the length of dipole, current to be fed to antenna and average power radiated by the antenna.

$$\left\{ \text{Given : } R_{rad} = 73 \text{ ohm}, \eta_o = 120\pi \text{ and } |E_\phi| = \frac{\eta_o I_O \cos\left(\frac{\pi}{2}\cos\theta\right)}{2\pi r \sin\theta} \right\}$$

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

a) Starting with Maxwell's equations, obtain the equation of power flow in a medium.

b) What are cavity resonators? Define Q factor of a cavity resonator.

c) What are microstriplines? What are the different types of losses in microstriplines?

d) A transmission line has reflection coefficient of $0.4\angle -42°$. Find the standing wave ratio.

e) "An optical fiber may be considered as a dielectric waveguide operating at few hundred T Hz". Is this statement correct? Substantiate your answer.

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

a) What is a MESFET? Draw its structure and explain the working.

b) Explain, with necessary schematics, the operation of Global Positioning system.

c) What are the sources of EMI ? How can EMI be reduced?

d) Find the radiation resistance of a hertzian dipole antenna if its length is dl = λ/20. Hence comment on the power radiated by it.

e) Explain the working of magnetron with suitable diagram.

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

a) What are the types of End-fire antennas? Draw the diagram of any one of them, with labelling, and show the dimensions with reference to wavelength λ. What does the directivity of this antenna depend upon ?

b) What does the directivity of parabolic dish antenna depend upon ?

c) Describe the electromagnetic effects in high speed digital systems.

d) Describe the operating principles of Read diode and IMPATT diode.

e) What are the advantages of microwave field-effect transistors over bipolar junction transistors ?

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Total No. of Questions : 5]

SEAT No. :

P557

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M.Sc.

ELECTRONIC SCIENCE

EL4 - UT - 06 : Control Systems : Theory and Applications (2008 Pattern) (Sem. - IV)

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

Instructions to the candidates:

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

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

a) What is the need for a control system? What are different types of control systems ? Explain feed forward control strategy.

b) What is the use of control system block diagram? Explain any six block diagram reduction rules.

c) i) Compare open-loop and closed-loop control.

ii) Elaborate what is meant by continuous and discontinuous control modes. Give suitable examples.

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

a) Explain how location of closed loop poles can be used to analyse stability of a control system.

b) Explain Zeigler-Nichols method for process loop tuning.

c) i) Explain ON/OFF controller circuit. What is its limitation? State any two applications for it.

ii) Give advantages and limitations of Routh's criterian.

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

a) Explain a circuit for PID controller. What are derivative overrun and integral windup in this regard?

P.T.O.

b) Draw a block diagram and explain the operation of a PLC.

c) i) Develop a ladder diagram for bottle filling plant.

ii) An integral controller is used for temperature control in a range of 0-250°C with a setpoint of 150°C. At zero error the controller output is 20%. Reset rate is -0.1% / sec per% error. If temperature jumps to180° calculate the controller output after 5 seconds.

Q4) Answer <u>any two</u> of the following : **[2 × 8 = 16]**

a) i) What are input and output status files? How do they work in a PLC.

ii) Explain smart programming terminal. What are its advantages?

b) Discuss processor scan cycle for General Electric Series 90 - 30 PLC.

c) i) Explain the features of watch dog timer and its use in PLC.

ii) Explain following comparison instructions. –NEQ –LEQ.

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

a) Explain sequencer instruction [SQO].

b) Explain the counter instruction [CTU].

c) A controller outputs 4 - 20 mA signal to control motor speed from 140 to 600 rpm with a linear dependance. Calculate

i) Current corresponding to 300 rpm and the value in

ii) Expressed as % of control output range.

d) For $G(s)\,H(s) = \dfrac{k}{s(s+2)}$ obtain the nature of root locus.

e) Draw a relay ladder diagram for a motor with :
NO start button
NC stop button
Thermal overload limit switch opens on high temperature.
Green light while running.
Red light for thermal overload.

f) Write a short note on solenoid.

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