Total No. of Questions : 5]

SEAT No. :

P530

[Total No. of Pages : 3

[4336] - 101

M.Sc. (Semester - I)

ELECTRONIC SCIENCE

EL1UT01 : Foundation of Semiconductor Devices

(2008 Pattern)

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) Discuss qualitatively formation of allowed and forbidden energy gaps in a crystal structure. State their importance.

b) Explain the construction of MOSFET. Discuss small dimension effects with respect to the threshold and narrow width.

c) Differentiate between JFET and MOSFET. Draw the small signal equivalent circuit for JFET and explain ac response of this device.

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

a) Mathematically discuss position of Fermi level for n - type and p- type semiconductor, comment on variation of E_F with doping concentration and temperature.

P.T.O.

b) Using proper energy band diagram , explain the phenomenon of tunneling in a p-n junction diode. State its applications.

c) Explain with diagram working principle of polysilicon Emitter BJT. Comment on the increase in common emitter current gain using this transistor.

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

a) State the importance of crystal planes and miller indices in choosing substrate.

b) What is the meaning of Fermi Dirac Probability Function ? State its use in semiconductor technology.

c) Describe the concept of excess carrier generation and recombination across a semiconductor.

d) Explain why the polarity of Hall voltage changes depending on the conducting type of semiconductor.

e) Discuss spice models for MOSFET.

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

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

b) Explain tunneling effect from energy position diagram of potential barrier and particle energy.

c) Describe the charge flow in forward bias Schottky barrier diode.

d) Explain Ebers - Moll model for BJT device . Draw and explain its equivalent circuit.

e) With the neat diagram explain working of MESFET. State its types and their applications.

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

a) Describe operation of reverse bias p–n junction diode. Obtain relation for junction capacitance.

b) Disucss switching characteristics of SCR. List its various applications in electronics.

c) Explain with diagram working of Heterojunction Bipolar Transistor (HBT) . List its various applications.

d) What are nonideal effects in JFET ? Explain any one in detail.

e) Write short note on modern FET structure with respect to select structure survey.

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Total No. of Questions : 5]

SEAT No. :

P531

[Total No. of Pages : 3

[4336] - 102

M.Sc. (Semester - I)

ELECTRONIC SCIENCE

EL1UT02 : Analog Circuit Design and Analysis

(2008 Pattern)

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 two :

a) What is a two - port network ? Explain its admittance, hybrid and transmission parameters. What is their significance ? **[8]**

b) i) What is the function of an equaliser. Explain Shunt equaliser. **[4]**

ii) What is transfer function ? What are poles and zeroes. Discuss their significance. **[4]**

c) i) Find the inverse Laplace transform of the following function.

$$F(s) = \frac{3s^2 + 4}{s(s^2 + 4)}$$ **[4]**

ii) For an op – amp integrator circuit $e_{in} = 0$ at $t \leq 0$. If R = 1M Ω and C= 1 μf what is e_{out} after 1 second if a +1volt dc signal is applied to the input and held for $t \geq 1$ second. What is 'integrator gain' for this circuit ? **[4]**

Q2) Solve any two :

a) i) Explain the working of Widlar current source. Discuss applications of constant current source in analog integrated circuits. **[4]**

P.T.O.

ii) An op - amp has a slew rate of 0.5 V/μsec. What is the maximum frequency for which the amplifier will give an undistorted sinu soidal output signal of $12V_{P-P}$ and 20 V_{P-P} ? **[4]**

b) What is temperature independent biasing ? Explain the working of temperature compensated zener reference source with self bias. **[8]**

c) i) Draw the circuit diagram of input stage of op – amp 741. What are the main functions performed by this stage ? **[4]**

ii) A 741 inverting amplifier with gain – 2 is driven by $\pm 8V_{P-P}$ triangular wave. Sketch and lable waveforms at V_{in}, V_{out} and inverting input. $V_{osat} = \pm$ 13 volt. **[4]**

Q3) Solve any two :

a) Discuss large signal time response characteristics of an op – amp. **[8]**

b) i) What is meant by frequency compensation ? Explain lead compensation **[4]**

ii) Give th design steps of a practical differentiator circuit. **[4]**

c) What is the need for a S/H circuit ? Explain the working of a high accuracy two op – amp S/H circuit. Define acquisition and apperture times. **[8]**

Q4) Solve any two :

a) i) What is a programmable op – amp ? Which of its parameters can be programmed ? How ? **[4]**

ii) Explain shielding and guarding techniques used in op – amp circuits. **[4]**

b) Why is it necessary to boost output current and voltage of an op–amp ? Explain the working of one circuit each for current and voltage boosting. What are special design considerations for a voltage booster circuit ? **[8]**

c) i) What is the need for low power design ? Explain important characteristics of a micropower op–amp. **[4]**

ii) Explain the working of a bridge amplifier with earthed bridge supply. Obtain equation for its output. **[4]**

Q5) Solve any four :

a) Explain performance specifications of D/A converters. **[4]**

b) Explain pipeline ADC architecture. What is its advantage ? **[4]**

c) How do high resolution D/A converters achieve monotonicity ? Explain voltage mode segmentation. **[4]**

d) Explain one application each of an ADC and DAC. **[4]**

e) Discuss the working of charge redistribution ADC. **[4]**

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Total No. of Questions : 5]

SEAT No. :

P532

[Total No. of Pages : 4

[4336] - 103

M.Sc. (Semester - I)

ELECTRONIC SCIENCE

EL1 UT03 : Instrumentation and Measurement Techniques

(2008 Pattern)

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

Instructions to the candidates:-

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

Q1) a) Answer any Two of the following : **[2 × 6 = 12]**

i) Describe the following with suitable example of each.

1) Direct and Indirect methods of measurement
2) Intelligent and dumb type instrumentation and
3) Deflection and null type instrumentation system

ii) What are the standard inputs for studying the dynamic response of a system.

Define the following -

1) Speed of the response
2) Measuring response
3) Fidelity and
4) Dynamic error

iii) What is loading effect ? Explain loading effect due to shunt connected and series connected instruments. How the loading effect minimized in both the cases.

P.T.O.

b) Describe the resistance potential divider. Derive the expression for its output voltage when connected across a meter of finite impedance. State the advantages of potentiometer. **[4]**

Q2) a) Answer any Two of the following: **[2 × 6 = 12]**

i) State different types of strain gauges. Derive an expression for gauge factor of wire wound strain gauge.

ii) List the transducers used for displacement measurement. Explain the working of LVDT with neat circuit diagram. State advantages and limitations of LVDT.

iii) State the properties of piezo - electric materials. Describe the piezo - electric transducer used for pressure measurement. Derive an expression for voltage output and charge sensitivity.

b) Explain working principle of the following: **[4]**

i) Thermal conductivity gauge.

ii) Dead weight gauge.

Q3) a) Answer any Two of the following : **[2 × 6 = 12]**

i) State different methods of flow measurement. Give working principle of the following -

1) Hot wire anemometer,

2) Ultrasonic flow meter,

3) Electromagnetic flowmeter and

4) Laser doppler velocity meter.

ii) Name the temperature transducers used for temperature measurement. Describe working of thermocouple. Explain the compensation techniques used in the thermocouple temperature measurement system.

iii) Draw the block diagram of general telemetry system. State the different types of telemetry systems used. Explain current telemetry system.

b) On what factor the choice of display device and recorders depends ? State the advantages of digital indicating instrument over analog one. **[4]**

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

a) Draw the circuit diagram and output equations for the following Op-Amp circuits.

i) Zero crossing detector,

ii) Voltage follower ,

iii) Differential Amplifier and

iv) Three Op- Amp instrumentation amplifier.

b) It is necessary to measure the position of an object. It moves 0.8 mm, its position must be known within 1 mm. Part of the mechanism which moves the object is a shaft, in a shaft that rotates 250^{o}. When the object moves from expreme to the other. A control potentiometer has been found which is rotated at 300^{o} full scale movement. The potentiometer has 1000 turns of wire. Is the potentiometer is suitable for the application ? Comment.

c) A 6.25 mm long Resistance Temperature Detector (RTD) with a steady gain of $0.3925^{o}C$ and a time constant of 5.5 second monitors the temperature of liquid flowing in a pipe. A cell of liquid which is at $75^{o}C$ hotter than the surrounding liquid passes the RTD. It takes 3 sec. for the cell of superheated liquid to pass. Plot the resistance of RTD as a function of time . The initial resistance of RTD is 100 Ω .

d) Determine the sensitivity of a link type load cell Wheatstone's bridge combination if $S_g = 2$, Poisson's ratio = 0.3 , $E_i = 10V$, $A = 5\ cm^2$ and $E = 200$ GPa.

The sensitivity of the transducer can be increased . If each gage in the bridge can dissipate 1W of power. Determine the maximum sensitivity that can be achieved without damaging the straingage ($Rg = 120\Omega$) .

Determine the voltage $(E_o / E_i)_{max}$ for the load cell, if the fatigue strength of the elastic member is 600 MPa.

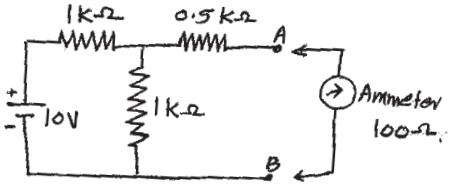
e) A knudsen gage is to be designed to operate at a maximum pressure of 2 μm of mercury. The spacing of the vane and plate is to be less than 0.3 mean free path at this pressure. Calculate the force on the vanes when the gas temperature is 27°C and the temperature difference is 40 K.

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

a) Define absolute error and relative error of measurement. A voltage has a true value of 1.50 V. An analog indicating instrument with scale range of 0 – 2.50 V shows voltage reading of 1.46V. What are the values of absolute error and correction.

Express the error as a fraction of true value and the full scale deflection.

b) It is desired to measure the value of current in 500 Ω resistor as shown below circuit , by connecting 100 Ω ammeter.



Find :

i) Actual value of current

ii) Measured value of current

iii) The % error in the measurement and accuracy.

c) An experiment is conducted to calibrate a copper - constantan thermocouple, with cold junction at 0°, emf obtained at boiling point of water (100°C) and boiling point of sulfer (445°C) are 5 mV and 25 mV respectively . The relation is assumed to be

$$e_{-t_1-t_2} = a(t_1 - t_2) + b(t_1^2 - t_2^2)$$

i) Determine constants a and b.

ii) The thermocouple indicates 2 mV with cold junction at 40°C, determine the unknown hot junction temperature.

iii) If the cold junction is maintained at 40°C , what would be the emf when the hot junction temperature is at 500°C ?

d) A wheat stone bridge requires a change of 7ohm in the unknown arm of the bridge to produce a change in deflection of 3 mm of the galvanometer. Determine the sensitivity and the deflection factor.

e) Draw neat circuit block diagram of DFM. Explain different modes of measurement with DFM.

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Total No. of Questions : 5]

P532 **[Total No. of Pages : 3**

[4336] - 103
M.Sc. (Semester - I)
ELECTRONIC SCIENCE
EL1 U0T03 : Opto Electronics
(2004 Pattern)

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 are necessary wherever required.***
4) ***Assume suitable standard values of constants.***

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

a) What are different light sources used in optical experiment ? What is monochromatic source of light ? State the advantages and applications of monochromatic source.

b) Describe the following terms in relation to injection laser , i) Relaxation oscillator ii) Frequency chirp , iii) Partition rise , iv) Mode hopping.

c) What is 'V' number. Explain its significance. If step - index fiber has V = 26.6 at 1300 nm wave length and core radius is 25 μm. Find numerical aperture.

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

a) State and explain the injection laser characteristics.

b) Explain the following terms

i) Numerical aperture

ii) Skew rays

iii) Internal quantum efficiency

iv) External quantum efficiency

P.T.O.

c) When 800 photons per second are incident on a p-i-n photodiode operating at a wavelength of 1.3 μm they generate on 550 electron/s which are collected. Calculate the responsivity of the device.

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

a) Discuss the mechanism of optical feedback to provide oscillation and hence amplification within the laser. Indicate how this provides a distinctive spectral output from the device.

b) Briefly describe linear scattering losses in optical fibers with regard to :

i) Rayleigh scattering,

ii) Mie scattering.

c) A ruby laser contains a crystal length of 4cm with a refractive index of 1.78. The peak emission wave length from the device is 0.55 μm. Determine the minimum number of longitudinal modes and their frequency separation.

Q4) a) Attempt any two of the following : **[2 × 6 = 12]**

i) What is tunable laser. Explain how prism and grating can be used for tuning laser beam.

ii) Discuss the function of the major elements of an optical fiber receiver with block diagram.

iii) Describe equilibrium mode distribution and cladding mode striping with reference to transmission measurement in optical fiber.

b) Write note on avalanche photo diode. **[4]**

Q5) a) Attempt any two of the following **[2 × 6 = 12]**

i) Describe any one method used for fiber refractive index profile measurement.

ii) An optical fiber system uses fiber cable which exibits a loss of 7 $dBkm^{-1}$. Average splice losses for the system are 1.5 $dBkm^{-1}$, and connector losses at the source and detector are 4dB each. After safety margins have been allowed , the total permitted channel loss is 37dB. Assuming the link to be attenuation limited , determine the maximum transmission distance without a repeater.

iii) What is fusion splicing of optical fibers ? Discuss the advantages and draw backs of this jointing technique.

b) Discuss optical fiber cable design with regard to : **[4]**

i) Fiber buffering.

ii) Cable strength and structural members.

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Total No. of Questions : 5]

SEAT No. :

P533

[Total No. of Pages : 2

[4336] - 201

M.Sc. - I (Semester - II)

ELECTRONIC SCIENCE

EL2 UT04 : Applied Electromagnetics, RF and Microwave

(2008 Pattern)

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) ***Log-book / Non programmable calculator is allowed.***

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

a) Consider plane wave incident normally on boundary between two media and analogus to transmission line. With neat diagram obtain relation for transmission coefficient and reflection coefficient.

b) Explain with neat diagram the dynamics of a wave travelling on a microstrip transmission line. Discuss fringing fraction and stripline impedance regarding this.

c) How antennas are classified? Discuss rectangular pyramidial horn antenna with respect to directivity, bandwidth and field pattern.

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

a) Explain MESFET and MOSFET with reference to physical structure, principle of operation and their applications.

b) What are electromagnetic effects in high speed digital systems? Explain any one with example.

c) Explain high directivity parabolic dish antenna. Discuss various factors that cause to reduce gain of this antenna.

P.T.O.

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

a) The electric field in an electromagnetic wave is given by E = 50N/C sinw (t –x/c). Find the energy contained in a cylinder of cross section $10cm^2$ and length 50 cm along x-axis.

b) Draw neat diagram of hollow rectangular waveguide. Explain its mode of operation with the concept of cut off frequency.

c) What are gauge transformations? Explain Lorentz gauge condition and Coulomb gauge.

d) Write short note on resonators.

e) What is meant by retarded potential? Explain it with respect to propagation of plane waves in space.

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

a) Show that the skin depth is given by $\delta = \sqrt{\frac{2}{\omega\mu\sigma}}$

b) Explain use of Smith chart for impedance matching in transmission line.

c) Discuss basic principle of operation of optical fiber as a rod waveguide.

d) What is RF heating? Why it is called as clean heating system? Give one example.

e) Consider a fiberglass circuit board with an $\varepsilon_{eff} = 2.8$ and an ECL technology with $T_r = 0.6$ ns. Calculate (i) speed of propagation on the board in ms^{-1} and $pscm^{-1}$, (ii) length of rising edge.

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

a) A common type of transmission line for microwave applications is having open circuit impedance of $150 \angle 50^{o}\,\Omega$ and short circuit impedance of $37.5 \angle -35^{o}\,\Omega$. Calculate characteristic impedance for this line.

b) Explain different types of microstriplines.

c) With respect to construction, working and applications discuss Yagi-Uda and Helical antenna.

d) Explain Gunn diode as microwave device.

e) Discuss how CD player on airplane interferes with navigation system.

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Total No. of Questions : 5]

SEAT No. :

P534

[Total No. of Pages : 2

[4336] - 202

M.Sc.(Semester - II)

ELECTRONIC SCIENCE

EL 2 UT05: Communication Electronics

(2008 Pattern)

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) Explain the working of balanced modulator used to suppress the carrier.

b) Describe internal and external noise in short.

c) With the help of circuit diagram, explain the working of tuned RF amplifier.

d) Draw and explain the working of adaptive delta modulation in short.

e) What is XMODEM protocol? Write the importance of it.

f) Draw and explain segregated ISDN architecture in short.

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

a) i) Draw the block diagram of basic communication system and explain the function of each element in short.

ii) Explain the importance of signal to noise ratio and noise figure.

b) i) For AM, show that the power contained in the sidebands is one third of the total power.

ii) An AM signal 2000 sin $\left(2\pi \times 10^8 t + 2\sin \pi \times 10^4 t\right)$ is applied to 50 Ω antenna. Calculate carrier frequency, transmitter power, modulation index and signal frequency.

c) With the help of circuit diagram, explain the working of collector and base neutralization methods in detail.

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

a) Draw and explain the block diagram of superheterodyne receiver.

P.T.O.

b) With the help of diagram, explain multistage tuned amplifier.

c) Draw the block diagram of pulse code modulation (PCM) and explain its working in short.

d) Explain the working principle of bluetooth technology.

e) With reference to satellite communication, explain the following terms.
   i) Up-link
   ii) Down link
   iii) Cross link
   iv) Propagation delay.

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

a) Explain the following error detection techniques in detail.

   i) Block check character and ii) cyclic redundancy check

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

c) Write short note on the following:

   i) DSL

   ii) CDMA techniques.

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

a) With the help of circuit diagram, explain the working of diode detector used for AM signal.

b) Draw the block diagram of TDM and explain its working in short.

c) Draw the SDLC basic format and explain the importance of each field in short.

d) With the help of suitable diagram explain NRZ and RZ digital signal encoding format in short.

e) Explain the working principle of QAM.

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Total No. of Questions : 5]

SEAT No. :

P535

[Total No. of Pages : 2

[4336] - 203

M.Sc. - I (Semester - II)

ELECTRONIC SCIENCE

EL2UT06 : Digital System Design Using VHDL

(2008 Pattern)

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 Two of the following **[2 × 8 = 16]**

a) Explain different types of VHDL sub programs. Write comparision between them.

b) Explain user defined data types in VHDL. Write VHDL code for 4 - bit binary counter.

c) i) Write VHDL code for 4 to 1 multiplexer using process statement.

ii) For the following signal declaration. Find the value of x_1, x_2, x_3, x_4.

```
Signal a : BIT : = '1' ;

Signal  b : BIT _VECTOR  ( 3 downto 0) :  = "1101";

Signal C : BIT _VECTOR ( 3 downto 0)  :  = "0010";

x1 ⇐ a & C,

x2 ⇐ b XOR C;

x3 ⇐  b sll 2 ;

x4 ⇐  b rol 2 ;
```

P.T.O.

Q2) Attempt any Four of the following. **[4 × 5 = 20]**

a) Design a circuit for 4 - bit priority encoder.

b) Design 4digit multiplexed display.

c) Design full adder using demultiplexer.

d) Write VHDL code for BCD to seven segment code conversion for common cathode seven segment display. Using conditional signal assignment statement.

e) Design a circuit for even parity generator and checker for 7 - bit message.

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

a) Design synchronous counter for the sequence 0 -2 - 4 - 3 - 5 - 6 - 1 - 0 using j–k flip–flops.

b) A binary sequence detector has a single input line that sequence detector looks for some specified sequence of inputs on this input line and outputs a '1' when desired sequence is found.

Draw state diagram, state table and write VHDL code using FSM to detect three consecutive 1s.

c) Write VHDL code for chocklet vending machine.

Q4) Attempt any TWO of the following. **[2 × 6 = 12]**

a) What is GAL ? Explain output logic microcell of 16 V 8 GAL.

b) Give the design of logic circuit of a processor unit. How will you combine logic and arithmetic circuits to form ALU. Illustrate with block diagram.

c) Write VHDL code for 4 - bit parallel adder - subtractor. Using Full adder as a component.

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

a) Explain in brief types of RAM . Write VHDL code for 16 × 8 RAM

b) Write comparision between PROM and EPROM with reference to principle of programming and data erase technique.

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

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Total No. of Questions : 5]

SEAT No. :

P536

[Total No. of Pages : 2

[4336] - 301
M.Sc - II (Semester-III)
ELECTRONIC SCIENCE
EL3 UT05 : Embedded Systems
(2008 Pattern)

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.***

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

a) Describe the timer modes of 8051 micro controller in short.

b) Explain serial peripheral interface (SPI) and controller area network (CAN) in short.

c) Describe the advantages of debugger in software development of embedded system.

d) Write an assembly / 'C' program for PIC microcontroller to initialize (2×16) LCD.

e) Write any four important features of ADC in AVR microcontroller.

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

a) List the ports of 8051 microcontroller and write the functions of them.

b) With the help of neat diagram, explain DAC interfacing with 8051 microcontroller.

c) Describe the status register structure of PIC microcontroller.

d) Write a 'C' program to flash 55H and AAH alternately. Eight LED's are connected to PORTD of AVR microcontroller.

e) Describe memory organization of PIC microcontroller.

P.T.O.

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

a) Draw the programming model of 8051 microcontroller and explain it in short.

b) i) Describe PCMCIA communication standard in short.

ii) Describe how speed of DC Motor is controlled by PWM technique.

c) Draw the PIC microcontroller architecture and explain it in short.

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

a) With the help of neat diagram, explain Hardvard and Von- Newman architecture.

b) Draw the interfacing diagram to interface 4 KB RAM with 8051 microcontroller and write the memory map of the same.

c) Write any four differentiating points between microprocessor and microcontroller based systems.

d) Describe cross _ compiler and simulator software development tools used for development of embedded systems.

e) Write an assembly / 'C' program to transmit' ELECTRONICS' string with band rate 9600 bps, one start and one stop bit for 8051 microcontroller. Write comment to each line of the program.

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

a) i) Write an assembly / 'C' program for 8051 microcontroller to generate a traingular wave using DAC interfacing.

ii) Draw the interfacing diagram of 4 × 4 matrix key board to 8051 microcontroller and write a procedure how to read a key.

b) i) Describe any four addressing modes of AVR microcontroller with suitable example.

ii) Describe different instructions related to program memory and data memory of AVR microcontroller.

c) i) Write on any two hardware tools used for development of embedded systems.

ii) Describe different steps to be followed for development of embedded systems.

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

P537 **[Total No. of Pages : 3**

[4336] - 401

M.Sc. (Semester - IV)

ELECTRONIC SCIENCE

EL4-UT-06 : Control Systems : Theory and Applications

(2008 Pattern)

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 two of the following: **[2 × 8 = 16]**

a) Draw a block diagram and explain the working of a feedback control system. How would you evaluate the performance of such a system.

b) i) Explain adaptive control strategy.

ii) Explain the difference between continuous control and discrete state process control.

c) i) A PI controller is used to control a certain process. The settings of the controller are K_p= 2% and K_i = 4% per minute, while $P_{(o)}$ = 50%. The error signal is found to be $3t + 7$ where t is the time. Find controller output in % after 1.5 minutes.

ii) Comment on the following statements
- Use proportional controller if offset is acceptable.
- Integral action may induce closed loop instability.

P.T.O.

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

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

ii) Consider a unity feedback system with $G(s) = \frac{k}{4s}$. Obtain its root locus.

b) i) Explain Routh-Hurwitz method of predicting stability of a control system.

ii) A system has $G(s) = \frac{2}{s(s+1)(s+2)}$ and $H(s) = 1$ with Routh- Hurwitz criterian determine its relative stability about the line $s = -1$.

c) Explain open-loop transient response method of process loop tuning.

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

a) Explain the data formats used in a PLC.

b) Explain I/O interaction with input and output status files in a PLC.

c) i) Give the procedure for obtaining transfer function of a control system.

ii) Transfer function of a system is given by

$T(s) = \frac{10(s+8)}{s(s+4)(s^2+6s+25)}$ obtain its poles, zeroes and order. Sketch its pole-zero plot.

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

a) What is a ladder diagram? How does a PLC ladder differs from conventional ladder. Develop a ladder diagram for coffee vending machine.

b) What are the data files in a typical PLC. Explain i) Processor status file and ii) Control file

c) i) How would you choose the correct PLC processor for a particular application.

ii) Explain the need for and method of documenting a PLC system.

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

a) Compare dumb and smart programming terminals.

b) Explain following data handling instructions.

– MOV and – Copy instruction [COP]

c) Explain following timer instruction.

– Retentive timer instruction [RTO]

d) Prepare a ladder diagram using two timers T_1 and T_2 to start three motors in a sequence following a START button being pressed. The three motors should be stopped by using a single stop push button.

e) Write a short note on an annunciator.

f) Explain open architecture control.

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