10/5/19 (M)

(6)

Exam.Code:0928
Sub. Code: 6903

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
MATHS-401: Linear Algebra and Complex Analysis

Time allowed: 3 Hours | Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Section.*

x-x-x

1. (A). Let V= R^3 and (i) $W=\{(a,b,c);a,b\in R\}$ then Show that W is a subspace of V.

(ii) $W=\{(a,b,c);a+b+c=0\}$ then Show that W is a subspace of V.

(iii) $W=\{(a,b,c);a\geq 0\}$ then Show that W is not a subspace of V. **(1+1)**

(B). Determine whether or not the following vectors in R^3 are linearly dependent:

$u = (1, -2, 1),\quad v = (2, 1, -1),\quad w = (7, -4, 1)$ **(1)**

(C). Define kernel and image of a linear transformation. **(1+1)**

(D) State Cauchy's Integral theorem. **(1)**

(E). Define conformal and Isogonal mappings with examples. **(1+1)**

(F) Define singular point of a complex valued function and classify singularities. **(1+1)**

SECTION A

2. (i) Show that the following matrix A satisfies the Cayley-Hamilton theorem. Hence find its inverse *i.e.*. A^{-1}:

$$A=\begin{bmatrix}1 & 0 & 2\\ 0 & 2 & 1\\ 2 & 0 & 3\end{bmatrix}$$ **(3+3)**

(ii) Find the eigen values and the corresponding eigen vectors of the following matrix:

$$A=\begin{bmatrix}8 & -6 & 2\\ -6 & 7 & -4\\ 2 & -4 & 3\end{bmatrix}$$ **(4)**

P.T.O.

3. Let U and W be two subspaces of a vector space V® over R. Then prove that
$$\dim(U+W) = \dim U + \dim W - \dim(U \cap W)$$ *(10)*

4. *Let* $T: R^3 \to R^3$ be the linear mapping defined by $T(x, y, z) = (x + 2y - z, y + z, x + y - 2z)$
Find a basis and the dimension of the (i) Image of U of T (ii) Kernel W of T. **(5+5)**

SECTION B

5. (i) Show that the function $f(z) = \sqrt{|xy|}$ is not analytic at the origin, although the Cauchy-Riemann's equations are satisfied at that point. **(6)**

(ii) Prove that $$\int_c \frac{1}{z-a} dz = 2\pi i$$

Where C is given by the equation $|z - a| = R$. **(4)**

6. Find the bilinear transformation which maps the points z = 0, – i , -1 into the points W = i , 1 , 0. Find the image of the line y = mx under this transformation. **(6+4)**

7. Expand $\frac{z^2 - 4}{(z+1)(z+4)}$, which are valid for the regions: **(6+2+2)**

(a) $0 < |z| < 1$ (b) $1 < |z| < 4$ (c) $|z| > 4$

x-x-x

13/5/19 (M) (7)

Exam. Code: 0928
Sub. Code: 6906

1059

B. Engg. (Electronics & Comm. Engg.)

4th Semester

EC-405: Computer Networks

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Q. No. I which is compulsory and selecting atleast two questions from each Unit.*

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I. (a) What do you understand by Router and Gateway?
   (b) What is congestion control?
   (c) What do you mean by Quality of Service?
   (d) Explain with example of concept of subnetting and supernatting.
   (e) What is cryptography? (5×2)

UNIT-I

II. (a) Briefly explain Aloha and slotted aloha protocols.
    (b) Explain and compare the functionalities of Hub, Bridge, switch, router and gateway. (5+5)

III. (a) What are the layers and protocols used in ATM?
     (b) What is the difference between congestion control and flow control? (5+5)

IV. Write short notes on the following: -
    (a) Wireless Lan
    (b) HDLC
    (c) CSMA
    (d) Gigabit Ethernet
    (e) SLIP and PPP (5×2)

UNIT-II

V. (a) Explain the Packet format of IPv_6. What are the advantages of IPv6 over IPv4?
   (b) What is the difference between network layer delivery and transport layer delivery? (6+4)

Contd.....P/2

VI. (a) What are the responsibilities of the transport layer? Explain TCP and UDP protocols.

(b) What is routing? Explain flooding and shortest path routing. (5+5)

VII. Write short notes on the following: -

(a) Distance vector routing

(b) Application layer protocols and applications

(c) Internet control protocols

(d) Elements of transport protocols (4×2½)

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(8)

Exam.Code:0928
Sub. Code: 7011

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
EC-404: Engineering Analysis and Design: Virtual Instrumentation

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) Draw the well labeled Lissajous Pattern if vertical input 10kHz, 5Vpeak and Horizontal input is 20kHz, 5Vpeak. Both the signals are 90degree out of phase.

b) Is photovoltaic cell an active or a passive transducer? Justify your answer.

c) Give an example of an Array and a Cluster.

d) With help of example, differentiate between analog and digital displays.

e) What is the working principle of thermocouple?

f) What is meant by Resolution?

g) List the applications of spectrum analyzer.

h) Define the principle of working of LVDT.

i) List merits of Virtual Instrumentation over Traditional Instrument.

j) What are the various applications in which null galvanometer can be used? (10x1)

UNIT – I

II. a) Discuss the principle of working of a Galvanometer. Derive the expression for deflection.

b) Draw the circuit diagram and obtain the balance bridge condition for Maxwell's bridge. What are its applications? Compare it with other bridges. (5,5)

III. a) Draw the block diagram of dual trace CRO. Discuss its working in Alternate/ Chop mode and X-Y mode. What is significance of Time base generator in CRO?

b) Explain the practical significance of various static characteristics of instruments. (5,5)

IV. a) With an example explain how a multi-range DC voltmeter can be designed

b) Discuss the detailed the working of Moving Iron Instruments. Derive its torque equation. (5,5)

P.T.O.

UNIT – II

V. a) What are various types of active and passive Photoelectric Transducers? Discuss their working principle and applications.

b) Discuss the operation of Inductive transducer. How these can be used to measure various physical parameters? (5,5)

VI. a) In VI explain and compare: For Loop and While Loop, Local and Global variable.

b) Explain the working of Analog weight scale using Instrumentation Amplifier. (5,5)

VII. a) What are applications of NI Data Acquisition? Explain various file formats supported in VI?

b) With an example discuss various types of loops in LabVIEW? Compare loop and Case Structure. (5,5)

x-x-x

(9)

Exam.Code:0928
Sub. Code: 6908

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
EC-407: Probability and Random Analysis

Time allowed: 3 Hours — Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.*

x-x-x

I. (a) What is link budgeting? (2)

(b) What are discrete memoryless channels? (1)

(c) Differentiate between ergodic process and stationary processes. (2)

(d) Which part of a typical communication system is most likely to be affected by channel noise? (1)

(e) Define noise figure of a network. (1)

(f) Describe relation between correlation and covariance functions. (2)

(g) What is binary symmetric channel? (1)

Part- A

II. (a) Define cumulative distribution function. Determine whether the following function is cumulative distribution function:

$$F_X(x) = \begin{cases} 0 & x < a \\ \frac{1}{2}\left(\frac{x}{a}+1\right) & -a \le x \le a \\ 1 & x > a \end{cases}$$ (4)

(b) Explain the operation of a typical communication system with the help of its block diagram. (3)

(c) Explain Rayleigh distribution function. (3)

III. (a) Explain band pass system. How can you evaluate the response of a bandpass system to an input bandpass signal? (5)

(b) Define PSD of a random process. Explain its properties. (5)

IV. (a) With the help of suitable examples define low-pass and band-pass signals. Express a band-pass signal in terms of its in-phase and quadrature components. (4)

P.T.O.

(b) Describe the concept of ergodicity. (2)

(c) Determine the mean value, mean square value and the variance of the random variable X, whose probability density function is given by:

$$f_X(x) = \frac{1}{2\pi} \quad for\ 0 \le x \le 2\pi$$ (4)

$$= 0 \quad \text{elsewhere}$$

Part-B

V. (a) Define entropy of a message source. A source emits one of the four symbols with probabilities 1/3, 1/6, 1/4 and 1/4 respectively. The successive symbols emitted by the source are statistically independent. Calculate the entropy of the source. (3)

(b) Define information. How it is measured form engineering viewpoint? (3)

(c) What do you mean by fixed length and variable length codes? (4)

VI. (a) Explain the concept of white noise. Why is it called idealized form of noise? (2)

(b) Find the Huffman code for the following messages with their probabilities given as:

Message	m_1	m_2	m_3	m_4	m_5	m_6	m_7
Probability	0.05	0.15	0.2	0.05	0.15	0.3	0.1

Also determine code efficiency. (4)

(c) Define narrowband noise. Represent narrowband noise in terms of in-phase and quadrature components. (4)

VII. (a) State and explain Shannon's channel capacity theorem. Explain the tradeoff between bandwidth and SNR. Define Shannon's limit. (4)

(b) A mixer stage has a noise figure of 20 dB. This mixer stage is preceded by an amplifier which has a noise figure of 9 dB and an available power gain of 15 dB. Find the overall noise figure referred to the input. (3)

(c) What is entropy? Prove that the entropy is maximized when all the messages are of equal probability. (3)

x-x-x

(10)

Exam.Code:0928
Sub. Code: 7010

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
EC-403: Communication Theory

Time allowed: 3 Hours | Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part. Use of scientific calculator is allowed.*

x-x-x

I. (a) Define 3-dB bandwidth of a signal. (1)
(b) Define LTI system. (1)
(c) Define narrowband noise. (2)
(d) Define ergodic process. (2)
(e) Differentiate between baseband and bandpass signal. (2)
(f) Define noise figure and noise temperature of a network. (2)

Part- A

II. (a) Explain the working of a communication system with the help of its block diagram. (3)
(b) Express a bandpass signal in terms of its in-phase and quadrature components. (4)
(c) Define independent random variables. Prove that the variance of a sum of such random variables is equal to the sum of their variances. (3)

III. (a) Define random process. Explain correlation and covariance functions of a random process. (4)
(b) State and explain central limit theorem. (4)
(c) Briefly explain different sources of information used in communication systems. (2)

IV. (a) Explain Gaussian random variable. Determine the cumulative distribution function of this random variable. (6)
(b) Determine the mean value, mean square value and the variance of the random variable X, whose probability density function is given by:

$$f_X(x) = \frac{1}{2\pi} \quad \text{for } 0 \le x \le 2\pi$$
$$= 0 \quad \text{elsewhere}$$
(4)

P.T.O.

Part-B

V. (a) A discrete message source generates seven messages whose probability of occurrences are described as follows:

Message	m_1	m_2	m_3	m_4	m_5	m_6	m_7
Probability	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Construct a Huffman source code for the message source and calculate the efficiency of the code. (5)

(b) State Shannon's channel capacity theorem. Explain the tradeoff between bandwidth and signal-to-noise ratio in a Gaussian channel. (5)

VI. (a) An event has six possible outcomes with the probabilities $P_1 = \frac{1}{2}, P_2 = \frac{1}{4}, P_3 = \frac{1}{8}, P_4 = \frac{1}{16}, P_5 = \frac{1}{32}$ and $P_6 = \frac{1}{32}$. Find the entropy of the system. Also find the rate of information, if there are 16 outcomes per second. (3)

(b) Define noise. Explain its types and their characterization in detail. (5)

(c) The bandwidth of a channel is 3.4 kHz.

(i) Calculate the information capacity of the channel for a signal-to-noise ratio of 30 dB.

(ii) Calculate the minimum signal-to-noise ratio required to support information transmission through the channel at the rate of 9.6 kbps. (2)

VII. (a) Describe FRIIS equation? What is its significance? (3)

(b) Describe the concept of fixed length and variable length codes? (4)

(c) Define discrete memoryless channels. (3)

x-x-x

(11)

Exam.Code:0928
Sub. Code: 6905

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
EC-402: Microcontrollers and Interfacing

Time allowed: 3 Hours | Max. Marks: 50

***NOTE:** Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) What are Embedded systems? Give examples.
b) What is the role of assembler Directives DB and EQU?
c) What is the total maximum address range of internal RAM and ROM of 8051 and PIC18? Also what is the bit addressable memory range for both?
d) What is the difference between DECFSZ 0AAH, F, 1 and DECF 0AAH, F, 0 by giving example?
e) Write instructions to add 88H and 93H. Show the status of the various flags of PIC18F after the addition of 88H and 93H.
f) Compare the various 8051 family members from ATMEL.
g) What is the minimum frequency of square wave that can be generated using mode 2 with XTAL=15KHz?
h) What is the difference between .ASM and .LST files?
i) List all the pointers registers used to access ROM and RAM in PIC18F.
j) Draw the diagram showing signals required to interface External RAM and 8051.

(10x1)

UNIT – I

II. a) Compare the relative advantages and disadvantages of HARVARD and VON NEUMANN architecture.

b) How RISC architecture is different from CISC architecture in terms of performance and applications?

c) Discuss the criteria of choosing a microcontroller.

d) Discuss various files generated during the compilation process. (3,2,2,3)

III. a) Write a program to load the accumulator with the value AAH and then complement the ACC 1000 times.

b) Using Diagrams of the internal circuitry discuss the working (as i/p and o/p) of port 1 and port 0 of 8051.

c) What are look-up tables? Store a look table consisting of 2's complement of first ten numbers in ROM starting from 40H. Write a program to find the 2's complement of all the five 8-bit numbers (all numbers are less than 10) stored in external RAM Locations from memory location 20H. Store the results in external RAM Locations from memory location 40H. Use look-up table approach to find the 2's complement and don't use any arithmetic and logical instructions.

(3,4,3)

IV. a) By example, explain what are relative jumps and why they lead to Relocatable code?

b) Assume that the lower two bits of P2 are connected to two switches. Write a program to send the following ASCII characters to PO based on the status of the switches:

0 0 send 'a' to P0
0 1 send 'b' to P0
1 0 send 'c' to P0
1 1 send 'd' to P0

P.T.O.

c) Interface a sensor externally to 8051. Write a single program using to do the following simultaneously:
   i) Generate a square wave with duty cycle 75% with ToN=3msec at Pl.O.
   ii) Count 100 pulses generated by the sensor. After count reaches 100 set P0.5 to HIGH. Also show all calculations and all SFR's used in the program. Assuming that XTAL-11.0592Mhz. (3,3,4)

UNIT – II

V. a) Write a program using Timer interrupts and serial interrupts to do the following simultaneously:
   i) Receive data serially and sent it to P3 and
   ii) Transmit serially "I LOVE INDIA" repeatedly.
   Assume that XTAL-11.0592 MHz Set the baud rate at 2400.

b) Discuss and compare different ways of connecting LED with 8051.

c) Interface 16*2 LCD to 8051. Write 8051 ALP to display NAMASTEY on first line and INDIA in the middle of second line. (4,2,4)

VI. a) Write PIC ALP to add ten 8-bit numbers stored in internal ROM from 500H. Store the result of addition and carry in internal RAM location 555H and 556H. Also send the result to any PORT.

b) Sketch hardware interfacing of ADC, Common Cathode Seven Segment Display and LM35 with microcontroller. Write ALP to display H on the SSD if the temperature sensed by LM35 is more than 20°C otherwise display C on SSD. Use approximate delay calculations.

c) List with general format all the arithmetic instructions of PIC18F. (4,4,2)

VII. a) Write PIC program to copy a block of 10 bytes of data from 35H to 610H.

b) Sketch the interfacing diagram of stepper motor connected to lower bits of port 1 of 8051. Write a ALP to rotate stepper motor continuously (using 4-step sequence) first 180° CW and then 90° CCW with a delay of more than 1sec after every step. Use approximate delay calculations Generate delay without using Timers. Assume that XTAL-11.0592Mhz.

c) Suppose a switch is connected to LSB of PORT A Write a program to check the status of SW and perform the following:
   i) If SW=0, send letter 'x' to PORT B
   ii) If SW=1, send letter 'y' to PORT C. (3,4,3)

x-x-x

(12)

Exam.Code:0928
Sub. Code: 6904

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
EC-401: Communication Engineering

Time allowed: 3 Hours Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit.*

x-x-x

I. Attempt the following:-

a) What are two limitations of Amplitude modulation?

b) Define narrowband FM

c) Define nyquist sampling theorem

d) Define capture effect

e) Define inter symbol interference (5x2)

UNIT – I

II. a) What is Vestigial Sideband Modulation? Explain how Vestigial Sideband Modulation is different from Single Sideband Modulation with diagram.

b) Describe the characteristics of superheterodyne receiver. (5,5)

III. a) Explain nonlinear effects in FM systems with derivation.
b) What is angle modulation? Illustrate the relation between frequency modulation & angle modulation. (6,4)

IV. Describe Pulse Amplitude Modulation with derivation and diagram. (10)

UNIT – II

V. a) What is companding? Differentiate A law and μ law companding.

b) Explain Adaptive delta modulation and how it is different from delta modulation. (5,5)

VI. a) Explain the receiver model and figure of merit of a communication receiver in detail.

b) Discuss noise in Amplitude Modulation system. (5,5)

VII. What is the criterion for zero ISI? Discuss controlled inter symbol interference in detail. (10)

x-x-x

13

Exam.Code:0928
Sub. Code: 6907

1059

B.E. (Electronics and Communication Engineering)
Fourth Semester
EC-406: Analog Electronic Circuits

Time allowed: 3 Hours — Max. Marks: 50

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Part.*

x-x-x

I. Attempt the following:-

(a) Define slew rate and discuss its significance.

(b) State the Barkhausen criterion for oscillation.

(c) Show how a potentiometer can be connected to an op amp circuit so that the output dc offset can be adjusted to its minimum value.

(d) For an op-amp differentiator with R = 100 KΩ and C = 0.1 μF, an input of 2 sin 1000 t is applied. Determine the value of V_0.

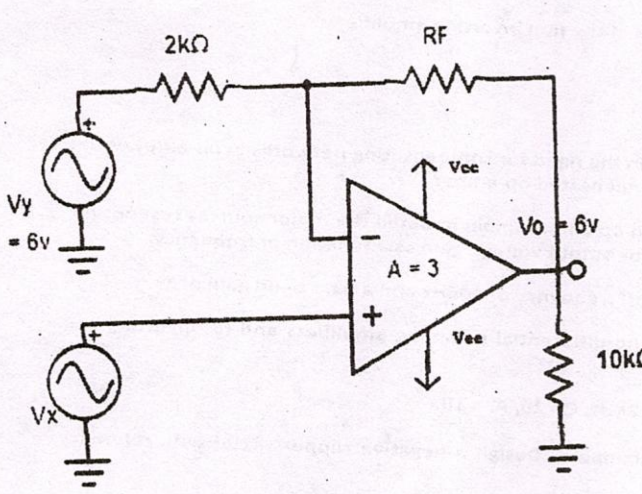
(e) Give any limitation of using Op-amp as a Comparator.

(f) What is thermal drift? How does it affect the performance of an op-amp circuit?

(g) List applications of Transconductance amplifiers.

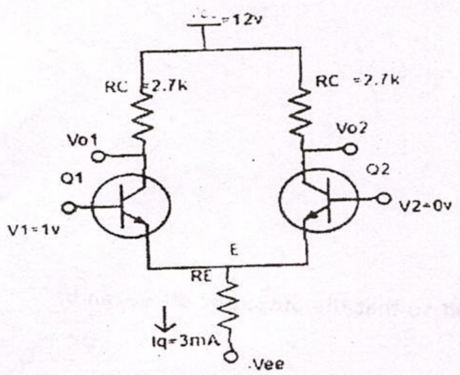
(h) Calculate the current gain of Darlington Connection.

(i) For the differential amplifier given below, Calculate V_x and R_f value.



(j) From the circuit, determine the output voltage (Assume α_F=1)

P.T.O.



10

PART- A

Q2. (a) What is a cascode amplifier? List the characteristics of the cascode amplifier. Draw equivalent circuit of cascode amplifier and calculate voltage gain, current gain and input resistance. 5

(b) Design the dual-input balanced -output differential amplifier using the diode constant current bias to meet the following specifications:

(a) Supply voltage V_s = ±12 V

(b) Emitter current I_E in each differential amplifier transistor = 1.5 mA.

(c) Voltage gain less than equal to 60. 5

Q3. (a) Draw and discuss the hybrid Π model for a transistor in CE configuration. 5

(b) What are the characteristics of an ideal op-amp? List three open-loop op-amp configurations. Explain why open-loop op-amp configuration is not used in linear applications. 5

Q4. (a) Briefly explain why negative feedback is desirable in amplifier applications? 5

(b) In what way is the voltage follower a special case of the non inverting amplifier. 3

(c) What is the need of Level Translator circuit? 2

PART- B

Q5. (a) What is a frequency response? Briefly explain the need for compensating networks in op-amps. What is the difference between compensated and noncompensated op-amps? 5

(b) Draw the high frequency equivalent circuit of an op amp. Explain in detail the major sources responsible for capacitive effect. Also evaluate the expression for output voltage gain as a function of frequency. 5

Q6. (a) Design a first order high pass filter at a cut-off frequency of 400Hz and a pass band gain of 1. 5

(b) Explain the difference between (a) inverting and differential summing amplifiers and (b) inverting and Noninverting averaging amplifiers. 5

Q7.(a) Design a narrow band pass filter so that f_c = 2KHz, Q= 20, A_f = 10. 5

(b) What is the difference between clipper and clampers? Design a negative clipper circuit with reference voltage (i) +3V (ii) -3V 5

x-x-x