B.Tech. Degree III Semester Examination November 2013

IT/CS/EC/CE/ME/SE/EB/EI/EE/FT 301 ENGINEERING MATHEMATICS II

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Examine the following system of equations for consistency

$$2x - 3y + 7z = 5$$
$$3x + y - 3z = 13$$
$$2x + 19y - 47z = 32$$

(b) Let $V_1 = (1,-1,0)$, $V_2 = (0,1,-1)$ and $V_3 = (0,0,1)$ be elements of R^3. Show that the set of vectors $\{V_1, V_2, V3\}$ is linearly independent.

(c) Obtain the Fourier series of $f(x) = |x|$ in $-\pi < x < \pi$, $f(x+2\pi) = f(x)$

(d) Find the Fourier cosine transform of

$$f(x) = \begin{cases} x & \text{for } 0 < x < 1 \\ 2 - x & \text{for } 1 < x < 2 \\ 0 & \text{for } x > 2 \end{cases}$$

(e) Find the Laplace transform of $\dfrac{\cos at - \cos bt}{t}$.

(f) Find the inverse Laplace transform of $\log\left(\dfrac{s+a}{s+b}\right)$

(g) Find a unit vector perpendicular to the surface $x^3 - xyz + z^3 = 1$ at $(1, 1, 1)$.

(h) Find the work done in moving a particle in the force field $F = 3x^2\vec{e} + (2xz - y)\vec{j} + z\vec{k}$ along the straight line from (0, 0, 0) to (2, 1, 3).

PART B

$(4 \times 15 = 60)$

II. (a) Using elementary transformation reduce the following matrix to its normal form. (7)

$$\begin{bmatrix} 1 & 2 & 0 & -1 \\ 3 & 4 & 1 & 2 \\ -2 & 3 & 2 & 5 \end{bmatrix}$$

(b) Find the eigen values and eigen vectors of the matrix $\begin{bmatrix} 6 & -2 & 2 \\ -2 & 3 & -1 \\ 2 & -1 & 3 \end{bmatrix}$. (8)

OR

III. (a) Using Cayley Hamilton theorem find A^{-1} if $A = \begin{bmatrix} 1 & 1 & 3 \\ 1 & 3 & -3 \\ -2 & -4 & -4 \end{bmatrix}$. (8)

(b) $T : R^4 \to R^3$ (7)

$$T\begin{bmatrix} x \\ y \\ z \\ w \end{bmatrix} = \begin{bmatrix} x + y + w \\ z \\ y + 2w \end{bmatrix}.$$

Find $Ker(T)$ and $ran(T)$ and their dimensions.

(P.T.O.)

IV. (a) Obtain a half range cosine series for (8)

$$f(m) = kx \quad \text{for } 0 \le x \le \ell/2$$
$$= k(\ell - x) \quad \text{for } \ell/2 \le x \le \ell$$

Deduce the sum of the series $\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \ldots\ldots$

(b) Solve the integral equation (7)

$$\int_0^\infty f(x) \sin tx \, dx = 1 \quad 0 \le t < 1$$
$$2 \quad 1 \le t < 2$$
$$0 \quad t \ge 2$$

OR

V. (a) If $f(x) = |\cos x|$ expand $f(x)$ as a Fourier series in the interval $(-\pi, \pi)$. (8)

(b) Using the Fourier integral representation show that (7)

$$\int_0^\infty \frac{\omega \sin x\omega}{1+\omega^2} d\omega = \frac{\pi}{2} e^{-x} \quad (x > 0).$$

VI. (a) Find the Laplace transform of the periodic function and using this find the Laplace transform of the function (10)

$$f(t) = \sin \omega t \quad 0 < t < \pi/\omega$$
$$0 \quad \pi/\omega < t < \frac{2\pi}{\omega}$$

(b) Apply convolution theorem to evaluate $L^{-1}\left[\frac{1}{s(s^2+4)}\right]$. (5)

OR

VII. (a) Use Laplace transform method to solve $\frac{d^2x}{dt^2} + 9x = \cos 2t$ if $x(0) = 1$, $x(\pi/2) = -1$. (5)

(b) Find the inverse Laplace transform (10)

(i) $\frac{s+1}{s^2+4s+5}$

(ii) $\frac{s^2+6}{(s^2+1)(s^2+4)}$

VIII. (a) Prove that $curl(grad\,\phi) = 0$. (6)

(b) Apply Stoke's theorem to evaluate $\int_C ydx + zdy + xdz$ where C is the curve of intersection of $x^2 + y^2 + z^2 = a^2$ and $x + z = a$. (9)

OR

IX. (a) Verify divergence theorem for $F = 4xz\vec{e} - y^2\vec{j} + yzk$ over the cube bounded by $x = 0,\ x = 1,\ y = 0,\ y = 1,\ z = 0,\ z = 1$. (9)

(b) A vector field is given by $F = (x^2 - y^2 + x)\vec{e} - (2xy + y)\vec{j}$ show that the field is irrotational and find its scalar potential. (6)

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B.Tech. Degree III Semester Examination November 2013

CS 302 LOGIC DESIGN

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

$(8 \times 5 = 40)$

I. (a) Convert the following:
(i) (0001 0110 0101 0111) BCD = ( ) 16.
(ii) (AD76)16 = ( ) 8.
(iii) (273)10 = ( ) Gray.

(b) Explain the postulates and the theorems of Boolean algebra.

(c) Draw the PLA block diagram and explain.

(d) Implement a Boolean function:
$F(w,x,y,z) = \sum(0,2,5,8,9,10,15)$ using Multiplexer.

(e) Differentiate between Synchronous Counter and Asynchronous Counter.

(f) Convert JK flip-flop to RS flip-flop.

(g) What is Totem pole connection? Why is it so called? Explain its working and mention its advantages.

(h) Distinguish between CMOS and TTL logic families.

PART B

$(4 \times 15 = 60)$

II. (a) Reduce the following Boolean expression: (5)
(i) $XYZ + YYZ + \overline{Y}Z + X\overline{Y}$
(ii) $X(YZ + \overline{Y}Z)$

(b) A circuit receives a 4-bit 8421 BCD code. Design the minimum SOP circuit to detect the decimal numbers 0,2,4,6,8. (10)

OR

III. (a) Prove the universal property of universal gates. (5)

(b) Reduce the expression using K-map and implement them with universal gates. (10)
$\sum m(0,1,2,3,4,6,8,9,10,11)$.

IV. (a) Explain the concept of a look ahead carry adder. (5)

(b) Design a 4-bit binary to BCD converter. (10)

OR

V. (a) Simplify the function using Quine Mc.Clusky method. (10)
$f(a,b,c,d) = \pi M(1,5,6,7,11,12,13,15)$.

(b) Design a full adder using two half adders. (5)

VI. (a) Design a synchronous counter to generate the following sequence. (10)
0,3,5,6,0,3,5,6,.....

(b) What is lock out? How can it be eliminated? (5)

OR

VII. (a) Distinguish between combinational and sequencial circuits. (5)

(b) Design and implement a 3 bit up/down counter using mode control. (10)

VIII. (a) Explain the interfacing of TTL to CMOS. (10)

(b) Explain Tri-state logic. (5)

OR

IX. (a) Write notes on: (10)
(i) Figure of merit (ii) Noise margin
(iii) Propagation delay (iv) Fan-in (v) Fan-out

(b) Explain with circuit diagram a typical 2-input NAND gate. (5)

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B. Tech. Degree III Semester Examination November 2013

IT/CS 303 DISCRETE COMPUTATIONAL STRUCTURES

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 x 5 = 40)

I. (a) Prove that $P \wedge (q \wedge \sim P)$ is a contradiction.

(b) By mathematical induction prove that

$$5+10+15+ \ldots +5n = \frac{5n(n+1)}{2}$$

(c) What is recursive algorithm. Write a recursive algorithm to find the maximum at a finite sequence of numbers.

(d) From a club consisting of 6 men and 7 women, in how many ways we can select a committee of 3 men and 4 women?

(e) Define bipartite graph with an example.

(f) Show that the number of vertices of odd degree in a graph is always even.

(g) Let G be a group and f: G → G given by $f(x) = x^{-1}$ is an isomorphism. Prove that G is abelian.

(h) Define a ring.

PART B

(4 x 15 = 60)

II. (a) Among 100 students, 32 study mathematics, 20 study physics, 45 study chemistry, 15 study mathematics and chemistry, 7 study mathematics and physics, 10 study physics and chemistry, 30 do not study any of three subjects. Find the number of students studying exactly one of the three subjects. (8)

(b) Using truth table, prove that (7)

$$P \vee (q \wedge r) \equiv (P \vee q) \wedge (P \vee r)$$

OR

III. (a) Define an equivalence relation. If R and S are equivalence relations on a set, show that RNS is also an equivalence relation. (7)

(b) Consider the functions f, g: R → R defined by $f(x) = x^2 + 3x + 1, g(x) = 2x - 3$ .Find the composition function

(i) (*i*) *fof* (*ii*) *fog* (*iii*) *gof* (*iv*) *gog* (8)

IV. (a) Solve the recurrence relation of the Fibnaci sequence of numbers (7)

$fn = fn-1 + fn-2,\ n \geq 2$ with the initial condition $f_0 = 1,\ f_1 = 1$

(b) What is complexity at an algorithm? Differentiate Bighoh and Theta notations. (8)

OR

(P.T.O.)

V. (a) Show that $\lg n! = (\sim)(n \lg n)$ (7)

(b) How many, permutations can be made out of the word 'COMPUTER'? How many of these (i) begin with C ? (8)
(ii) end with R ?
(iii) begin with C and end with R ?

VI. (a) Draw the connected graph represented by the incidence matrix (5)

$$\begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} \begin{array}{c} \begin{array}{ccccc} e_1 & e_2 & e_3 & e_4 & e_5 \end{array} \\ \begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 & 0 \end{bmatrix} \end{array}$$

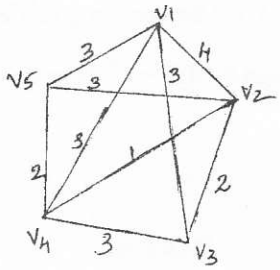
(b) Define Eulers path and Hamiltonian circuit with examples. (5)

(c) Define Complete graph and Regular graph with examples. (5)

OR

VII. (a) Define minimal spanning tree (5)

(b) Find the minimal spanning tree of the weighted graph shown in the figure using Prim's Algorithm (10)



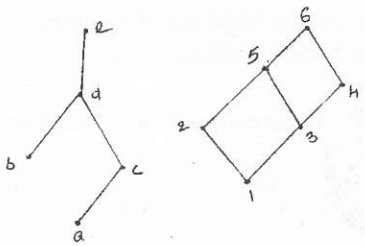
VIII. (a) Consider an algebraic system (Q,∗) where Q is the set of rational numbers and ∗ is a binary operation defined by $a * b = a + b - ab, a, b \in Q$. Determine whether (Q,∗) is a group. (8)

(b) Let $((S,*) \, and \, (T,*^1))$ be monoids with identity e and e_1 respectively. (7)
Let $f : S \to T$ be an isomorphism. Then show that $f(e) = e^1$

OR

IX. (a) Consider the set $D_{50} = \{1,2,5,10,25,50\}$ and $a \le b$ if a divides b. (7)
(i) Draw the Hasse diagram of $(D_{50}, \le)$
(ii) Define all upper bounds of 5 and 10.
(iii) Determine all lower bounds of 5 and 10

(b) Define Lattice. Determine whether the posets shown in the figure one Lattice or not. (8)



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BTS – III – 11.13 – 1193

B.Tech. Degree III Semester Examination November 2013

IT/CS 304 OBJECT ORIENTED PROGRAMMING USING C++

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Explain benefits of object oriented programming.

(b) Explain different types of inheritance

(c) What is the use of virtual function? Give example.

(d) What are the different techniques used in C++ to achieve polymorphism?

(e) What is late binding?

(f) What is exception and how it is handled in C++?

(g) Explain how member functions and static variable are managed in memory.

(h) Explain:

(i) inline function
(ii) member function
(iii) virtual functions
(iv) recursive function
(v) friend function

PART B

(4 × 15 = 60)

II. (a) Explain features of object oriented programming. (5)

(b) Explain operator overloading with an example. (5)

(c) Explain data hiding with suitable example. (5)

OR

III. (a) Compare procedure programming with object oriented programming. (5)

(b) Explain various control structures (conditional and loop) used in C++. (10)

IV. (a) Define a class matrix having 3 x 3 integer array to hold elements. Overload + operator to add two matrices. Write all necessary member functions. Illustrate C = A + B in the main program area. (10)

(b) Explain the use of constructor and destructor. (5)

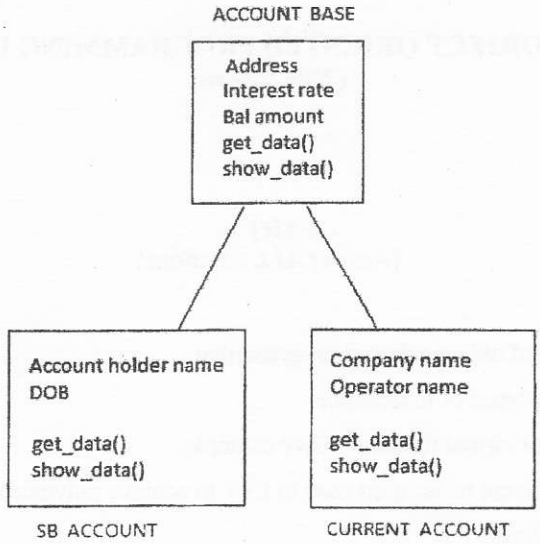
OR

V. Define a class 'String', use constructor for dynamic initialization and destructor to destroy objects. Overload + operator to combine 2 string objects. Overload = = operator to check two string objects are equal or not. Illustrate the string use of operators in the main program. (15)

(P.T.O)

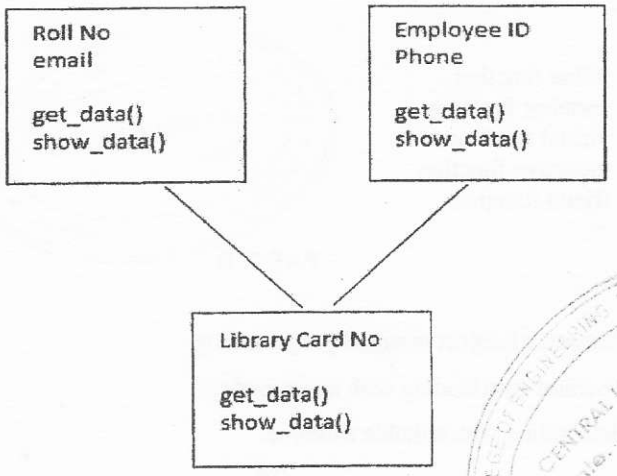
VI. (a) Explain abstract class with example. (5)

(b) Write a C++ program to implement following inheritance. (10)



OR

VII. (a) Write a C++ program to implement the following inheritance. (10)



(b) Explain advantages of inheritance. (5)

VIII. (a) Write a C++ class having following messages to manage text tiles. (10)

(i) Constructor – takes files as parameter and open the file.

(ii) get_char_count()- returns number of characters in the file.

(iii) get_para_count()- returns number of paragraph in the file.

(iv) Convert_to_lower()-convert all characters in to lowercase and store result in file named lw.txt

(b) Explain seekp(), seekg() tellp() and tellg()functions. (5)

OR

IX. (a) Define a class having properties name, reg_no and marks in three. (10)
Subjects-M1, M2 & M3. Write necessary messages to read_data() and display_data(). Using a main program read 20 student records and write the same to disk file. Write another program to read all student records from the file and display mark list (name, reg_no, and total mark).

(b) Explain stream class hierarchy in C++. (5)

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BTS – III – 11.13 –1210

B.Tech. Degree III Semester Examination November 2013

CS 305 PRINCIPLES OF PROGRAMMING LANGUAGES

(2006 Scheme)

Time : 3 Hours | Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) What are the factors affecting readability of a programming language?

(b) What is meant by denotational semantics?

(c) Describe variable initialization and named constant.

(d) What do you mean by coroutines?

(e) Write a note on data abstraction and polymorphism.

(f) Explain how encapsulation is implemented in JAVA.

(g) What is meant by lambda calculus?

(h) Write a note on clausal form.

PART B

(4 × 15 = 60)

II. Explain the formal methods of describing syntax and semantics. (15)

OR

III. Explain attribute grammar with suitable example. (15)

IV. (a) Differentiate between scope and lifetime of a variable. (5)

(b) What is a subprogram. Explain the design issues of a subprogram. (10)

OR

V. Explain various methods of passing parameters to subprograms with suitable examples. (15)

VI. Explain the features of object oriented programming languages. (15)

OR

VII. What is an exception handling? How is the exception handling implemented in C++ and Java? (15)

VIII. Explain the functional programming language LISP. (15)

OR

IX. Explain the applications of logic programming. (15)

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B.Tech. Degree III Semester Examination November 2013

CS/EB/EE 306 ELECTRONIC DEVICES AND CIRCUITS

(2006 Scheme)

Time : 3 Hours Maximum Marks : 100

PART A

(Answer *ALL* questions)

(8 × 5 = 40)

I. (a) Explain the process of avalanche breakdown in a PN junction diode. How does it differ from zener breakdown?

(b) Explain the working of a voltage multiplier.

(c) Compare BJT and FET.

(d) Define h parameter. Draw the h parameter equivalent of a transistor in CE configuration.

(e) Why are class AB power amplifiers used? Compare its performance with class C amplifier.

(f) Why is heat sink used? Discuss its design considerations.

(g) Explain the working of combinational clipper with the help of transfer characteristics.

(h) Draw and explain a simple transistor sweep circuit.

PART B

(4 × 15 = 60)

II. (a) Explain the working of a bridge rectifier with the help of neat sketches. Derive the expression for nipple factor. (10)

(b) Compare the different rectifier circuits with the help of tabular column. (5)

OR

III. (a) Draw the structure of a PIN diode and explain its working. (7)

(b) Explain the working of enhancement mode MOSFET with the help of characteristic curves. (8)

IV. (a) List the different types of biasing techniques used for transistors. Which is the best among these? Justify your answer. (12)

(b) What do you understand by AC load line? (3)

OR

V. (a) Draw the circuit diagram of CE RC coupled amplifier. Draw and explain its frequency response highlighting the effect of bypass and coupling capacitor. What is the significance of 3 db bandwidth? (10)

(b) Explain how FET can be used as a voltage variable resistor. (5)

VI. (a) Explain the working of complementary symmetry power amplifier with suitable diagram. (9)

(b) Explain the concept of negative and positive feed back. What is the necessary and sufficient condition for oscillation? (6)

OR

VII. (a) Explain the working of a RC phase shift oscillator with a circuit diagram. (8)

(b) Draw and explain a crystal oscillator circuit. (7)

VIII. (a) What is a differentiator? What is an integrator? Compare them with the help of circuit diagram and waveforms. Mention their applications. (10)

(b) Explain a negative clamper circuit. (5)

OR

IX. (a) Draw the circuit diagram of a monostable multivibrator. Explain its operations with the help of relevant waveforms. (9)

(b) Draw and explain bootstrap sweep circuit. (6)

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