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10MAT31

Third Semester B.E. Degree Examination, June/July 2013

Engineering Mathematics - III

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Obtain the Fourier series expansion of $f(x)=\begin{cases} x, & \text{if } 0\le x\le \pi \\ 2\pi - x, & \text{if } \pi\le x\le 2\pi \end{cases}$ and hence deduce that $\frac{\pi^2}{8}=\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+\ldots\ldots$ **(07 Marks)**

b. Find the half range Fourier sine series of $f(x)=\begin{cases} x, & \text{if } 0<x<\pi/2 \\ \pi - x, & \text{if } \pi/2<x<\pi \end{cases}$. **(06 Marks)**

c. Obtain the constant term and coefficients of first cosine and sine terms in the expansion of y from the following table: **(07 Marks)**

x	0	60°	120°	180°	240°	300°	360°
y	7.9	7.2	3.6	0.5	0.9	6.8	7.9

2 a. Find the Fourier transform of $f(x)=\begin{cases} a^2-x^2, & |x|\le a \\ 0, & |x|>a \end{cases}$ and hence deduce $\int_0^\infty \frac{\sin x - x\cos x}{x^3}dx=\frac{\pi}{4}$. **(07 Marks)**

b. Find the Fourier cosine and sine transform of $f(x) = xe^{-ax}$, where $a > 0$. **(06 Marks)**

c. Find the inverse Fourier transform of e^{-s^2}. **(07 Marks)**

3 a. Obtain the various possible solutions of one dimensional heat equation $u_t = c^2 u_{xx}$ by the method of separation of variables. **(07 Marks)**

b. A tightly stretched string of length l with fixed ends is initially in equilibrium position. It is set to vibrate by giving each point a velocity $V_o \sin\left(\frac{\pi x}{l}\right)$. Find the displacement u(x, t). **(06 Marks)**

c. Solve $u_{xx} + u_{yy} = 0$ given $u(x, 0) = 0$, $u(x, 1) = 0$, $u(1, y) = 0$ and $u(0, y) = u_0$, where u_0 is a constant. **(07 Marks)**

4 a. Using method of least square, fit a curve $y = ax^b$ for the following data. **(07 Marks)**

x	1	2	3	4	5
y	0.5	2	4.5	8	12.5

b. Solve the following LPP graphically:
Minimize $Z = 20x + 16y$
Subject to $3x + y \ge 6$, $x + y \ge 4$, $x + 3y \ge 6$ and $x, y \ge 0$. **(06 Marks)**

c. Use simplex method to
Maximize $Z = x + (1.5)y$
Subject to the constraints $x + 2y \le 160$, $3x + 2y \le 240$ and $x, y \ge 0$. **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – B

5 a. Using Newton-Raphson method find a real root of $x + \log_{10} x = 3.375$ near 2.9, corrected to 3-decimal places. **(07 Marks)**

b. Solve the following system of equations by relaxation method:
$12x + y + z = 31, \quad 2x + 8y - z = 24, \quad 3x + 4y + 10z = 58$ **(07 Marks)**

c. Find the largest eigen value and corresponding eigen vector of following matrix A by power method

$$A = \begin{bmatrix} 25 & 1 & 2 \\ 1 & 3 & 0 \\ 2 & 0 & -4 \end{bmatrix}.$$

Use $X^{(0)} = [1, 0, 0]^T$ as the initial eigen vector. **(06 Marks)**

6 a. In the given table below, the values of y are consecutive terms of series of which 23.6 is the 6^{th} term, find the first and tenth terms of the series. **(07 Marks)**

x	3	4	5	6	7	8	9
y	4.8	8.4	14.5	23.6	36.2	52.8	73.9

b. Construct an interpolating polynomial for the data given below using Newton's divided difference formula. **(07 Marks)**

x	2	4	5	6	8	10
f(x)	10	96	196	350	868	1746

c. Evaluate $\int_0^1 \frac{x}{1+x^2} dx$ by Weddle's rule taking 7-ordinates and hence find $\log_e 2$. **(06 Marks)**

7 a. Solve the wave equation $u_{tt} = 4u_{xx}$ subject to $u(0, t) = 0$; $u(4, t) = 0$; $u_t(x, 0) = 0$; $u(x, 0) = x(4 - x)$ by taking $h = 1$, $k = 0.5$ upto four steps. **(07 Marks)**

b. Solve numerically the equation $\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial x^2}$ subject to the conditions $u(0, t) = 0 = u(1, t)$, $t \geq 0$ and $u(x, 0) = \sin \pi x$, $0 \leq x \leq 1$. Carryout computations for two levels taking $h = \frac{1}{3}$ and $k = \frac{1}{36}$. **(07 Marks)**

c. Solve the elliptic equation $u_{xx} + u_{yy} = 0$ for the following square mesh with boundary values as shown in Fig.Q7(c). **(06 Marks)**

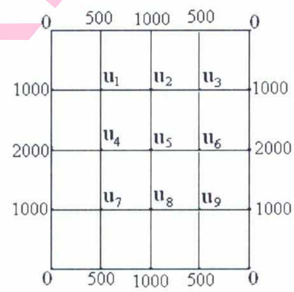

Fig.Q7(c)

8 a. Find the z-transform of: i) $\sin h\, n\theta$; ii) $\cos h\, n\theta$. **(07 Marks)**

b. Obtain the inverse z-transform of $\frac{8z^2}{(2z-1)(4z-1)}$. **(07 Marks)**

c. Solve the following difference equation using z-transforms:
$y_{n+2} + 2y_{n+1} + y_n = n$ with $y_0 = y_1 = 0$ **(06 Marks)**

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Third Semester B.E. Degree Examination, June/July 2013
Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. With neat figures, explain the construction and operational principle of an Uni Junction Transistor (UJT). **(10 Marks)**

b. Find the values of resistors RB, RC, RE and the transistor gain β, for the circuit shown in Fig. Q1 (b). Given that, IB = 40 μA, IC = 4 mA, VE = 2 V, VCE = 12 V and supply voltage VCC = 15 V. Assume that the transistor used in the circuit is a silicon transistor. **(05 Marks)**

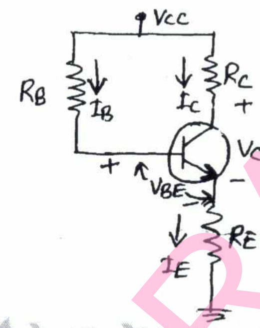

Fig. Q1 (b)

c. Explain thermal runaway as referred to transistor. **(05 Marks)**

2 a. What are the differences between JFET's and MOSFET's? **(05 Marks)**

b. With the help of neat figures, explain the construction and characteristics of N-channel depletion MOSFET. **(10 Marks)**

c. Fig. Q2 (c) shows a biasing configuration using DE-MOSFET. Given that the saturation drain current is 8 mA and the pinch off voltage is – 2 V. Determine the value of gate-source voltage, drain current and the drain source voltage. **(05 Marks)**

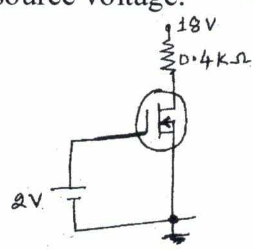

Fig. Q2 (c)

3 a. Define the following terms: i) Responsivity (R) ii) Noise equivalent power (NEP) iii) Detectivity iv) Quantum efficiency v) Response time. **(05 Marks)**

b. What is photo transistor? Draw the schematic symbol of a phototransistor. Explain the V-I characteristics of photo-transistor. **(05 Marks)**

c. Explain different modes of operation of an LCD display. **(10 Marks)**

4 a. Draw the generalized h-parameter model of a transistor based amplifier and derive the expression for:

i) Current gain ii) Input impedance iii) Voltage gain iv) Output admittance. **(10 Marks)**

b. With neat figure explain the operation of Darlington amplifier. **(05 Marks)**

c. What are cascade amplifiers? What are the advantages offered by the cascade amplifiers? **(05 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

PART – B

5 a. What are the advantages of negative feedback? **(05 Marks)**

b. Derive the relevant expressions to prove that input resistance increases and output resistance reduces in case of voltage-series feed back. **(08 Marks)**

c. Refer to Fig. Q5 (c) of op-amp based inverting amplifier circuit. Identify the type of negative feedback. Determine the trans impedance gain, the input impedance and output impedance of the amplifier, given that transimpedance, input impedance and output impedance parameters of the op-amp are 100 MΩ, 10 MΩ and 100 Ω respectively. **(07 Marks)**

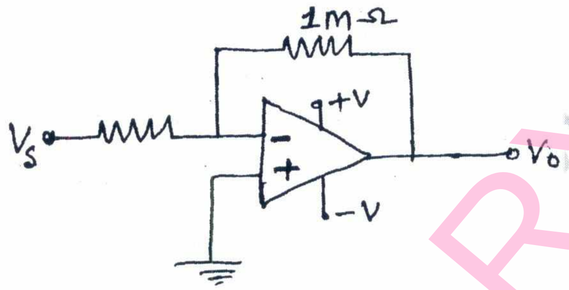

Fig. Q5 (c)

6 a. Explain the Bark hausen criterion as referred to oscillators. **(05 Marks)**

b. With neat figure, explain the operation of voltage controlled oscillator. **(07 Marks)**

c. With neat figure and relevant wave forms explain the operation of astable multivibrator using IC555 timer. **(08 Marks)**

7 a. Name the constituent parts of a basic linearly regulated power supply. Briefly describe the function of each of the constituent parts. **(05 Marks)**

b. Define : i) load regulation ii) line regulation iii) ripple rejection factor with reference to regulated power supplies. **(03 Marks)**

c. With neat figure, explain the working of a buck-regulator. **(07 Marks)**

d. Refer to the three terminal regulator circuit of Fig. Q7 (d). Determine : i) Load current ii) Current through LM7812 iii) Current through external transistor iv) Power dissipated in LM7812. Take $V_{BE}(Q1) = 0.7$ V **(05 Marks)**

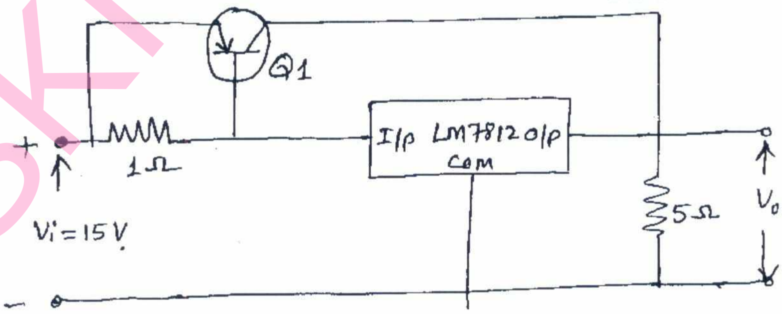

Fig. Q7 (d)

8 a. Define the following as referred to op-amp: i) CMRR ii) PSRR iii) Slew rate iv) Band width v) Open loop gain. **(05 Marks)**

b. With neat figure, explain the operation of a peak detector circuit using op-amp. **(07 Marks)**

c. With neat figure and relevant wave forms explain the working of relaxation oscillator circuit using op-amp. **(08 Marks)**

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10CS33

Third Semester B.E. Degree Examination, June/July 2013

Logic Design

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting at least TWO questions from each part.***

PART – A

1 a. Write the truth table of the logic circuit having 3 inputs A, B and C and the output expressed as $Y = \overline{A}BC + ABC$. Also simplify the expression using Boolean algebra and implement the logic circuit using NAND gates. **(06 Marks)**

b. Name universal gates. Realize basic gates using NAND gates. **(08 Marks)**

c. Explain positive and negative logic. **(06 Marks)**

2 a. Give sum-of-product and product of sum circuit for, $f(A,B,C,D) = \sum m\,(6, 8, 9, 10, 11, 12, 13, 14, 15)$ **(08 Marks)**

b. Find essential prime implicants for the Boolean expression by using Quine-McClunky method. $f(W,X,Y,Z) = \sum m\,(1, 3, 6, 7, 8, 9, 10, 12, 13, 14)$ **(12 Marks)**

3 a. Design a 16 to 1 multiplexer using two 8 to 1 multiplexer and one 2 – to – 1 multiplexer. **(06 Marks)**

b. Explain n-bit magnitude comparator. **(08 Marks)**

c. Design 7-segments decoder using PLA. **(06 Marks)**

4 a. Explain Schimmit trigger. **(06 Marks)**

b. Give state transition diagram of SR, D, JK and T FlipFlops. **(08 Marks)**

c. Show how a D Flip-Flop can be converted into JK – Flop Flop. **(06 Marks)**

PART – B

5 a. Design 3-bit PISO (Use D – FlipFlop). **(06 Marks)**

b. Design two 4-bit serial adder. **(06 Marks)**

c. Design 4-bit Johnson counter with state table. **(08 Marks)**

6 a. Design Synchronous mod 6 up-counter using JK – Flip Flop. **(10 Marks)**

b. Explain digital clock with block diagram. **(10 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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7 a. Reduce state transition diagram (Moore model) Fig. Q7 (a) given below by,
i) Row elimination method and
ii) Implication table method, with partition table. **(12 Marks)**

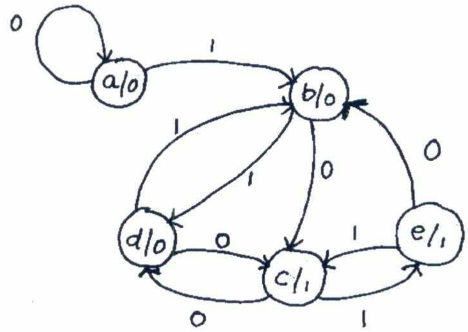

Fig. Q7 (a)

b. Design an asynchronous sequential logic circuit for state transition diagram shown below Fig. Q7 (b). **(08 Marks)**

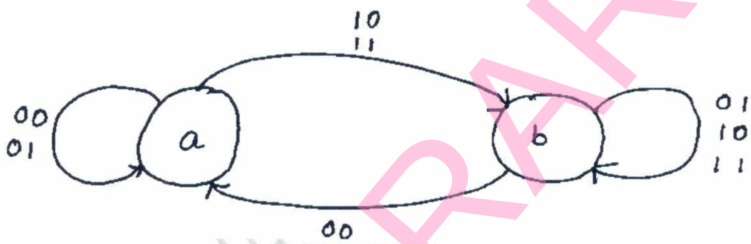

Fig. Q7 (b)

8 a. Explain with logic diagram 3-bit simultaneous A/D converters. **(10 Marks)**
b. Explain with neat diagram, single – slope A/D converter. **(10 Marks)**

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10CS34

Third Semester B.E. Degree Examination, June/July 2013
Discrete Mathematical Structure

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define a set, proper subset and power set, with an example for each. **(06 Marks)**

b. A survey of 500 television viewers of a sports channel produced the following information : 285 watch cricket, 195 watch hockey, 115 watch football, 45 watch cricket and football, 70 watch cricket and hockey, 50 watch hockey and football and 50 do not any of the three kinds of games.

i) How many viewers in the survey watch all three games?

ii) How many watch exactly one of the sports? **(07 Marks)**

c. The probability that a contractor will get a plumbing contract is 2/3 and the probability that he will not get an electric contract is 5/9. If the probability of getting at least one contract is 4/5. What is the probability that he will get both the contracts? **(07 Marks)**

2 a. Define a tautology and contradiction. Prove that the proposition $[(p \to r) \wedge (q \to r)] \to (p \vee q) \to r]$ is a tautology. **(06 Marks)**

b. Prove the following logical equivalences using laws of logic

i) $[(\sim p \vee \sim q\} \to (p \wedge q \wedge r)] \Leftrightarrow p \wedge q$

ii) $p \to (q \to r) \Leftrightarrow (p \wedge q) \to r$. **(07 Marks)**

c. Define converse, inverse and countrapositive of a conditional with truth table. Also state the converse, inverse and contrapositive of the following statement.

"If a triangle is not isosceles, then it is not equilateral". **(07 Marks)**

3 a. Write down the following proposition in symbolic form and find its negation :

"All integers are rational numbers and some rational numbers are not integers". **(06 Marks)**

b. Show that the following argument is valid. NO engineering student of first or second semester studies logic

<u>Anil is an engineering student who studies logic</u>

$\therefore$ Anil is not in second semester. **(07 Marks)**

c. Give i) a direct proof ii) an indirect proof iii) proof by contradiction for the following statement :

"If n is an odd integer, then n + g is an even integer". **(07 Marks)**

4 a. State the induction principle. Prove the following result by mathematical induction :

"For every positive integer n, 5 divides $n^5 - n$". **(06 Marks)**

b. Find an explicit definition of the sequence defined by $a_1 = 7$, $a_n = 2a_{n-1} + 1$ for $n \geq 2$. **(07 Marks)**

c. If L_0, L_1, L_2 - - - - are Lucas numbers, prove that

$$L_n = \left[\frac{1+\sqrt{5}}{2}\right]^n + \left[\frac{1-\sqrt{5}}{2}\right]^n.$$ **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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PART – B

5 a. For any non-empty sets A, B, C prove the following :
i) $(A \cap B) \times C = (A \times C) \cap (B \times C)$
ii) $A \times (B - C) = (A \times B) - (A \times B)$. **(06 Marks)**

b. Define a binary relation. Let A = {1, 2, 3, 4, 6} and R be a relation on A defined by $a^R b$ if and only if a is a multiple of b. Represent R as a set of ordered pairs. Draw the digraph of R. Write the matrix of R. **(07 Marks)**

c. Define an equivalence relation. Let N be the set of all natural numbers. On $N \times N$, the relation R is defined as $(a, b)^R (c, d)$ if and only if $a + d = b + c$. show that R is an equivalence relation. Find the equivalence class of the element (2, 5). **(07 Marks)**

6 a. Let $f : z \to z$ be defined by $f(a) = a + 1$ for $a \in z$. Show that f is a bijection. **(06 Marks)**

b. Find the number of ways of distributing four distinct objects among three identical containers with some container (s) possibly empty. **(07 Marks)**

c. If $f : A \to B$, $g : B \to C$ and $h : C \to D$ are three functions then prove that $(hog)of = ho(gof)$. **(07 Marks)**

7 a. Let G be the set of all non-zero real numbers and let $a * b = \frac{1}{2} ab$. Show that $(G\ *)$ is an abelian group. **(06 Marks)**

b. State and prove Lagrange's theorem. **(07 Marks)**

c. The word C = 1010110 is sent through a binary symmetric channel. If p = 0.02is the probability of incorrect receipt of a signal, find the probability that C is received as r = 1011111. Determine the error pattern. **(07 Marks)**

8 a. The parity check matrix for an encoding function $E : z_2^3 \to z_2^6$ given by

$$H = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}$$

i) Determine the associated generator matrix
ii) Does this code correct all single errors in transmissions? **(06 Marks)**

b. For the following encoding function, find the minimum distance between the code words. Indicate the error – detecting and error –correcting capabilities of each code

$E : z_2^3 \to z_2^6$ defined by

E(0 0 0) = 000111	E(0 0 1) = 001001
E(0 1 0) = 010010	E(0 1 1) = 011100
E(1 0 0) = 100100	E(1 0 1) = 101010
E(1 1 0) = 110001	E(1 1 1) = 111000.

(07 Marks)

c. Prove that the set z with binary operations $\oplus$ and $\odot$ defined by $x \oplus y = x + y - 1$ and $x \odot y = x + y - xy$ is a commutative ring. **(07 Marks)**

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Third Semester B.E. Degree Examination, June/July 2013

Data Structure with C

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. Define pointer. With examples, explain pointer declaration, pointer initialization and use of the pointer in allocating a block of memory dynamically. **(06 Marks)**

b. Define recursion. Give two conditions to be followed for successive working of recursive program. Given recursive implementation of binary's search with proper comments. **(06 Marks)**

c. Define three asymptotic notations and give the asymptotic representation of function 3n + 2 in all the three notations and prove the same from first principle method. **(08 Marks)**

2 a. What is a structure? Give three different ways of defining structure and declaring variables and method of accessing members of structures using a student structure with roll number, name and marks in 3 subjects as members of that structure as example. **(06 Marks)**

b. Give ADT sparse matrix and show with a suitable example sparse matrix representation storing as triples. Give simple transpose function to transpose sparse matrix and give its complexity. **(08 Marks)**

c. How would you represent two sparse polynomials using array of structure and also write a function to add that polynomials and store the result in the same array. **(06 Marks)**

3 a. Give ADT stack and with necessary function, explain implementing stacks to hold records with different type of fields in stack. **(06 Marks)**

b. Give the disadvantage of ordinary queue and how it is solved in circular queue. Explain the same. Explain with suitable example how would you implement circular queue using dynamically allocated arrays. **(08 Marks)**

c. Convert the infix expression a/b – c + d ∗ e – a ∗ c into postfix expression. Write a function to evaluate that postfix expression and trace that for given data a=6, b=3, c=1, d=2, e=4. **(06 Marks)**

4 a. Give the mode structure to create a linked list of integers and write C functions to perform the following :

i) Create a three –node list with data 10, 20 and 30
ii) Inert a node with data value 15 in between the nodes having data values 10 and 20
iii) Delete the node which is followed by a node whose data value is 20
iv) Display the resulting singly linked list. **(08 Marks)**

b. With node structure show how would you store the polynomials in linked lists? Write C function for adding two polynomials represented as circular lists. **(06 Marks)**

c. Write a note on :

i) Linked representation of sparse matrix
ii) Doubly linked list. **(06 Marks)**

PART – B

5 a. Define a binary tree and with example show array representation and linked presentation of binary tree. **(06 Marks)**

b. Write an expression tree for an expression A/B + C * D + E. Give the algorithm for inorder, postorder and preorder traversals and apply that traversal method to the expression tree and give the result of transversals. **(08 Marks)**

c. Define a Max Heap. Explain clearly inserting an element that has value 21 for the heap shown in Fig. Q5(c), given below and show the resulting heap. **(06 Marks)**

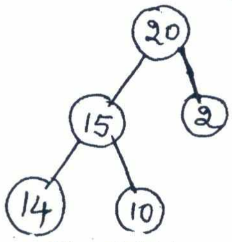

Fig. Q5(c)

6 a. Define a binary search tree and construct a binary search tree. With elements {22, 28, 20, 25, 22, 15, 18 10, 14}. Give recursive search algorithm to search an element in that tree. **(06 Marks)**

b. With is a winner tree? Explain with suitable example a winner tree for k = 8. **(06 Marks)**

c. Construct a binary tree having the following sequences.

i) Preorder sequence : ABCDEFGHI

ii) Inorder sequence : BCAEDGHFI

Show the steps if constructing binary tree in the above example. **(03 Marks)**

d. Give the adjauncy matrix and adjacinty lists representation for the graph shown in Fig. Q6(d). **(05 Marks)**

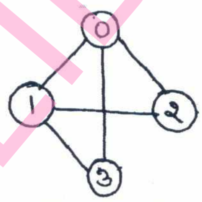

Fig. Q6(d)

7 a. Define the following :

i) Single ended priority queues

ii) Double ended priority queues

iii) Height –based leftist trees

iv) Weight – based leftist trees

v) A binomial tree

vi) Extended binary tree. **(06 Marks)**

b. With suitable example, explain leftist trees and give structure of nodes. **(06 Marks)**

c. What is Fibonacci heap? Give suitable example and give the steps for deletion of node and decrease key of specified node in F – heap. **(08 Marks)**

8 a. What is an AVL tree? Stating with an empty AVL tree perform the following sequence of insertions, MARCH, MAY NOVEMBER, AUGUST, APRIAL, JANUARY, DECEMBER, JULY, FEBRYARY, DRAW the AVL tree following each insertion and state rotation type if any for any insert operation. **(10 Marks)**

b. Define RED – BLACK trees and give its additional properties starting with an empty red-block tree insert the following keys in the given order {50, 10, 80, 90, 70, 60, 65, 62}, giving color changing and rotation instances. **(10 Marks)**

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Third Semester B.E. Degree Examination, June/July 2013
Object Oriented Programming with C++

Time: 3 hrs. Max. Marks:100

Note: ***Answer FIVE full questions, selecting atleast TWO questions from each part.***

PART – A

1 a. What is a statement? Explain jump statements with syntax. **(08 Marks)**
b. What is inline function? Write a C++ program to find maximum of 2 numbers using inline function. **(04 Marks)**
c. What is function overloading? Explain with example, why function overloading is important? **(08 Marks)**

2 a. What is class? Explain the syntax of class. **(08 Marks)**
b. Mention the restrictions that are placed on static member functions. **(04 Marks)**
c. What is paramterized constructor? Explain the different methods of passing arguments to the parameterized constructor with example. **(08 Marks)**

3 a. What are friend functions? What are the advantages of using friend functions? Write a C++ program to find sum of 2 numbers, using friend functions. **(08 Marks)**
b. What are generic functions? Explain with syntax. **(04 Marks)**
c. Write a C++ program to demonstrate the addition of two longitude and latitude values by overloading + operator. **(08 Marks)**

4 a. What is inheritance? Explain the syntax of defining derived classes. **(08 Marks)**
b. What is copy constructor? When the copy constructor is employed? Explain with syntax. **(04 Marks)**
c. Explain protected base – class inheritance, with suitable example. **(08 Marks)**

PART – B

5 a. Explain when constructors and destructors are executed? Explain the order of invocation of constructors and destructors in multilevel inheritance with a suitable program. **(10 Marks)**
b. Explain how to pass parameters to base – class constructors, with suitable program. **(10 Marks)**

6 a. What is virtual function? What is the use of virtual function? Write a C++ program to demonstrate calling of virtual function through a base class relevance. **(10 Marks)**
b. What is pure virtual function? Explain with syntax. **(04 Marks)**
c. What is an abstract class? How it supports run-time polymorphism? **(02 Marks)**
d. Mention the differences between early binding and late binding. **(04 Marks)**

7 a. What are streams in C++? Mention four built – in streams that are automatically opened when a C++ program beings execution. **(06 Marks)**
b. Explain width( ), precision( ) and fill( ) functions. **(06 Marks)**
c. What are I/O manipulators? List and mention the purpose of C++ I.O manipulators. **(08 Marks)**

8 a. What is an exception? Explain the syntax of try and catch. **(05 Marks)**
b. What are containers? Mention any four container classes defined by STL. **(05 Marks)**
c. Explain any six commonly used member functions defined by vector. **(06 Marks)**
d. Explain any four commonly used member functions of map. **(04 Marks)**

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MATDIP301

Third Semester B.E. Degree Examination, June/July 2013

Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Find modulus and amplitude of $1+\cos\theta+i\sin\theta$. **(06 Marks)**

b. If n is positive integer, prove that $(\sqrt{3}+i)^n+(\sqrt{3}-i)^n=2^{n+1}\cos\left(\frac{n\pi}{2}\right)$. **(07 Marks)**

c. Find the cube root of $1+i$ and represent them in the Argand diagram. **(07 Marks)**

2 a. Find the n^{th} derivative of $e^{ax}\sin(bx+c)$. **(06 Marks)**

b. If $y=e^{m\cos^{-1}x}$, prove that $(1-x^2)y_{n+2}-(2n+1)xy_{n+1}-(n^2+m^2)y_n=0$. **(07 Marks)**

c. Find the n^{th} derivative of $\dfrac{x^2}{(x+2)(2x+3)}$. **(07 Marks)**

3 a. Prove that $\tan\phi=r\dfrac{d\theta}{dr}$ with usual notations. **(06 Marks)**

b. Find the pedal equation for the curve $r=a(1+\cos\theta)$. **(07 Marks)**

c. Expand $f(x)=\sqrt{1+\sin 2x}$ using Maclaurin's series upto 4^{th} term. **(07 Marks)**

4 a. If $u=\tan^{-1}\left(\dfrac{x^3+y^3}{x-y}\right)$, prove that $x\dfrac{\partial u}{\partial x}+y\dfrac{\partial u}{\partial y}=\sin 2u$. **(06 Marks)**

b. If $u=f(x-y, y-z, z-x)$, prove that $\dfrac{\partial u}{\partial x}+\dfrac{\partial u}{\partial y}+\dfrac{\partial u}{\partial z}=0$. **(07 Marks)**

c. If $u=\tan^{-1}x+\tan^{-1}y$ and $V=\dfrac{x+y}{1-xy}$, find the value of $\dfrac{\partial(u,v)}{\partial(x,y)}$. **(07 Marks)**

5 a. Obtain the reduction formula for $\int\cos^n x\,dx$ where n is a positive integer. **(06 Marks)**

b. Evaluate $\displaystyle\int_0^2 x^{5/2}\sqrt{2-x}\,dx$. **(07 Marks)**

c. Evaluate $\displaystyle\int_1^2\int_3^4 (xy+e^y)\,dydx$. **(07 Marks)**

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
2. Any revealing of identification, appeal to evaluator and /or equations written eg, 42+8 = 50, will be treated as malpractice.

6 a. Evaluate $\int_0^1\int_0^1\int_0^1 e^{x+y+z}\,dxdydz$. **(06 Marks)**

b. Prove that $\left\lceil\frac{1}{2}\right. = \sqrt{\pi}$. **(07 Marks)**

c. Show that $\int_0^{\pi/2}\sqrt{\sin\theta}\,d\theta \times \int_0^{\pi/2}\frac{1}{\sqrt{\sin\theta}}\,d\theta = \pi$ **(07 Marks)**

7 a. Solve $xy\frac{dy}{dx} = 1 + x + y + xy$. **(06 Marks)**

b. Solve $\left[x\tan\left(\frac{y}{x}\right) - y\sec^2\left(\frac{y}{x}\right)\right]dx + x\sec^2\left(\frac{y}{x}\right)dy = 0$ **(07 Marks)**

c. Solve $\frac{dy}{dx} + y\cot x = 4x\operatorname{cosec}x$. **(07 Marks)**

8 a. Solve $\frac{d^2y}{dx^2} - 6\frac{dy}{dx} + 9y = 2e^{3x}$. **(06 Marks)**

b. Solve $\frac{d^2y}{dx^2} - \frac{dy}{dx} - 2y = \sin 2x$. **(07 Marks)**

c. Solve $\frac{d^2y}{dx^2} + 4y = 1 + x^2$ **(07 Marks)**

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