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10MAT31

Third Semester B.E. Degree Examination, June/July 2014
Engineering Mathematics – III

Time: 3 hrs. Max. Marks:100

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

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 – A

1 a. Find Fourier series of $f(x) = 2\pi x - x^2$ in $[0, 2\pi]$. Hence deduce $\sum_{1}^{\infty} \frac{1}{(2n-1)^2} = \frac{\pi^2}{8}$. Sketch the graph of f(x). **(07 Marks)**

b. Find Fourier cosine series of $f(x) = \sin\left(\frac{m\pi}{\ell}\right)x$, where m is positive integer. **(06 Marks)**

c. Following table gives current (A) over period (T):

A (amp)	1.98	1.30	1.05	1.30	-0.88	-0.25	1.98
t (sec)	0	T/6	T/3	T/2	2T/3	5T/6	T

Find amplitude of first harmonic. **(07 Marks)**

2 a. Find Fourier transformation of $e^{-a^2x^2}$ $(-\infty < x < \infty)$ hence show that $e^{-x^2/2}$ is self reciprocal. **(07 Marks)**

b. Find Fourier cosine and sine transformation of

$$f(x) = \begin{cases} x & 0 < x < a \\ 0 & x \geq a \end{cases}$$ **(06 Marks)**

c. Solve integral equation $\int_0^\infty f(x)\cos sx\,dx = \begin{cases} 1-s & 0 < s < 1 \\ 0 & s \geq 1 \end{cases}$. Hence deduce $\int_0^\infty \frac{1-\cos x}{x^2}dx = \frac{\pi}{2}$. **(07 Marks)**

3 a. Find various possible solution of one dimensional wave equation $\frac{\partial^2 u}{\partial t^2} = c^2 \frac{\partial^2 u}{\partial x^2}$ by separable variable method. **(07 Marks)**

b. Obtain solution of heat equation $\frac{\partial u}{\partial t} = c^2 \frac{\partial^2 u}{\partial t^2}$ subject to condition u(0, t) = 0, u(ℓ, t) = 0, u(x, 0) = f(x). **(06 Marks)**

c. Solve Laplace equation $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ subject to condition u(0, y) = u(ℓ, y) = u(x, 0) = 0; $u(x, a) = \sin\left(\frac{\pi x}{\ell}\right)$. **(07 Marks)**

4 a. The revolution (r) and time (t) are related by quadratic polynomial $r = at^2 + bt + c$. Estimate number revolution for time 3.5 units, given

Revolution	5	10	15	20	25	30	35
Time	1.2	1.6	1.9	2.1	2.4	2.6	3

(07 Marks)

b. Solve by graphical method,
Minimize $Z = 20x_1 + 10x_2$ under the constraints $2x_1 + x_2 \geq 0$; $x_1 + 2x_2 \leq 40$; $3x_1 + x_2 \geq 0$; $4x_1 + 3x_2 \geq 60$; $x_1, x_2 \geq 0$. **(06 Marks)**

c. A company produces 3 items A, B, C. Each unit of A requires 8 minutes, 4 minutes and 2 minutes of producing time on machine M_1, M_2 and M_3 respectively. Similarly B requires 2, 3, 0 and C requires 3, 0, 1 minutes of machine M_1, M_2 and M_3. Profit per unit of A, B and C are Rs.20, Rs.6 and Rs.8 respectively. For maximum profit, how many number of products A, B and C are to be produced? Find maximum profit. Given machine M_1, M_2, M_3 are available for 250, 100 and 60 minutes per day. **(07 Marks)**

PART – B

5 a. By relaxation method, solve $-x+6y+27z=85$, $54x+y+z=110$, $2x+15y+6z=72$. **(07 Marks)**

b. Using Newton Raphson method derive the iteration formula to find the value of reciprocal of positive number. Hence use to find $\frac{1}{e}$ upto 4 decimals. **(06 Marks)**

c. Using power rayley method find numerical largest eigen value and corresponding eigen vector for $\begin{bmatrix} 10 & 2 & 1 \\ 2 & 10 & 1 \\ 2 & 1 & 10 \end{bmatrix}$ using $(1, 1, 0)^T$ as initial vector. Carry out 10 iterations. **(07 Marks)**

6 a. Fit interpolating polynomial for f(x) using divided difference formula and hence evaluate f(z), given f(0) = - 5, f(1) = -14, f(4) = -125, f(8) = -21, f(10) = 355. **(07 Marks)**

b. Estimate t when f(t) = 85, using inverse interpolation formula given : **(06 Marks)**

t	2	5	8	14
f(t)	94.8	87.9	81.3	68.7

c. A solid of revolution is formed by rotating about x-axis, the area between x-axis, lines x = 0, x = 1 and curve through the points with the following co-ordinates.

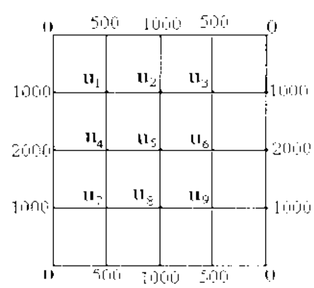
x	0	1/6	2/6	3/6	4/6	5/6	1
y	0.1	0.8982	0.9018	0.9589	0.9432	0.9001	0.8415

by Simpson's $3/8^{th}$ rule, find volume of solid formed. **(07 Marks)**

7 a. Using the Schmidt two-level point formula solve $\frac{\partial^2 u}{\partial x^2} = \frac{\partial u}{\partial t}$ under the conditions $u(0, t) = u(1, t) = 0$; $t \geq 0$; $u(1, 0) = \sin \pi x$ $0 < x < 1$, take $h = \frac{1}{4}$ $\alpha = \frac{1}{6}$. Carry out 3 steps in time level. **(07 Marks)**

b. Solve the wave equation $\frac{\partial^2 u}{\partial t^2} = 4\frac{\partial^2 u}{\partial x^2}$ subject to $u(0, t) = u(4, t) = u_t(x, 0) = 0$, $u(x, 0) = x(4-x)$ take h = 1 k = 0.5. **(06 Marks)**

c. Solve $\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$ in the square mesh. Carry out 2 iterations. **(07 Marks)**



8 a. State and prove recurrence relation of f-transformation hence find $Z_T(n)$, $Z_T(n^2)$. **(07 Marks)**

b. Find $Z_T[e^{n\theta}\cosh n\theta - \sin(nA+\theta)+n]$. **(06 Marks)**

c. Solve difference equation $u_{n+2}+6u_{n+1}+9u_n = n2^n$ given $u_0 = u_1 = 0$. **(07 Marks)**

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10CS32

Third Semester B.E. Degree Examination, June/July 2014
Electronic Circuits

Time: 3 hrs. Max. Marks:100

Note: ***1. Answer any FIVE full questions, selecting atleast TWO questions from each part.***
2. Any missing data may be assumed suitably.

PART – A

1 a. Draw a self bias circuit using BJT and derive the expressions for operating point. Mention its advantages and disadvantage. **(08 Marks)**

b. For the circuit shown in Fig.Q.1(b), determine the operating point. Given $\beta = 100$, $V_{BE} = 0.7V$. **(04 Marks)**

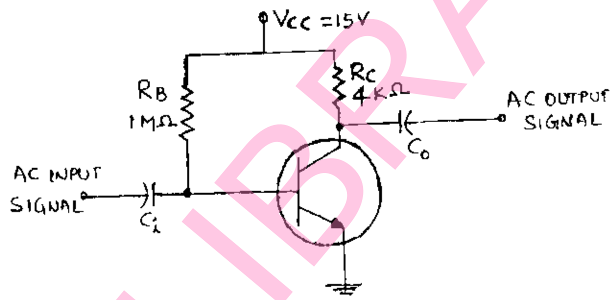

Fig.Q.1(b)

c. Explain the construction and operating principle of uni junction transistor (UJT) with relevant sketches. **(08 Marks)**

2 a. Explain the construction, working and characteristics of N-channel E-MOSFET with neat sketches. **(10 Marks)**

b. Give a comparision between JFETs and MOSFETs (any four). **(04 Marks)**

c. Briefly discuss the basic operation of CMOS inverter with a neat diagram. Mention any two advantages. **(06 Marks)**

3 a. With a neat diagram, explain the working of a photo conductor. Show how resistance varies with illuminance. Draw any two application circuits. **(10 Marks)**

b. What is an optocoupler? Explain the parameters of optocoupler. **(06 Marks)**

c. A photodiode has a noise current of 1×10^{-15}A, responsivity of 0.5 A/W, active area of $1mm^2$ and rise time of 3.5ns. Determine its i) NEP; ii) Detectivity; iii) D*; iv) Quantum efficiency at 850nm. **(04 Marks)**

4 a. Obtain the expression for current gain, input impedance, voltage gain and output admittance of a transistor amplifier using complete h-parameter model. **(12 Marks)**

b. Fig.Q.4(b) shows a Darlington amplifier. The two transistors Q_1 and Q_2 are identical and the h-parameters for both the transistors are $h_{ie} = 1K\Omega$, $h_{fe} = 100$ and $h_{oe} = 40 \times 10^{-6}$ mhos. The values of voltages $V_{cc} = 15V$, $V_{BE1} = 0.7V$ and $V_{BE2} = 0.7V$. Determine the following: i) Input impedance; ii) Output impedance; iii) Voltage gain; iv) Current gain. **(08 Marks)**

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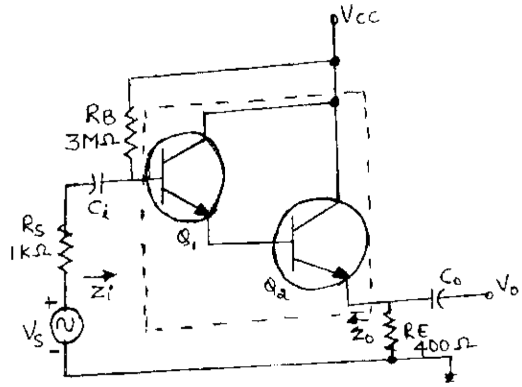

Fig.Q.4(b)

PART – B

5 a. Derive the expression for voltage gain, input resistance and output resistance in a voltage series feedback topology. **(10 Marks)**

b. List the advantages and disadvantages of negative feedback. **(06 Marks)**

c. Derive an expression for gain of an amplifier with feedback in terms of gain without feedback. **(04 Marks)**

6 a. Explain the operation of monostable multivibrator with a neat diagram. **(08 Marks)**

b. Explain RC low pass circuit and discuss the behaviour of this circuit towards step and pulse inputs. **(08 Marks)**

c. Write a note on Barkhausen criterion. **(04 Marks)**

7 a. Explain the operation of buck regulator with a neat diagram. **(10 Marks)**

b. Design a power transformer with a multi-output secondary and the following input/output specifications:

I. Primary voltage: 220V, 50Hz.

II. Secondary voltage: i) 12-0-12V at 100mA and ii) 5V at 1A.

Assume B = 60,000 lines per square inch and an efficiency of 90%. **(06 Marks)**

c. Define load regulation and line regulation of regulated power supply. **(04 Marks)**

8 a. List and explain the performance parameters of operational amplifiers. **(08 Marks)**

b. Explain the working of comparator as zero crossing detectors. **(06 Marks)**

c. For the relaxation oscillator circuit shown in Fig.Q.8(c), determine the heat to heat amplitude and frequency of the square wave output given that saturation output voltage of the opamp is ±12.5V at power supply voltages of ±15V. **(06 Marks)**

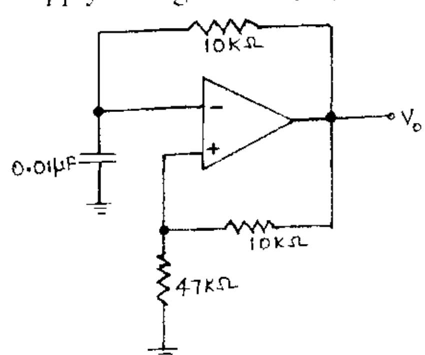

Fig.Q.8(c)

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Third Semester B.E. Degree Examination, June/July 2014

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. Define rise time, fall time in a digital waveform. What is the value of high duty cycle (duty cycle H) if the frequency of a digital waveform is 5 MHz and the width of the positive pulse is 0.05 μs? **(04 Marks)**

b. Realize the basic gates using only NAND gates. **(06 Marks)**

c. What is positive and negative logic? List the equivalences in positive and negative logic. **(04 Marks)**

d. Write a verilog HDL code using structural model for two input AND gate and prepare test-bench to simulate the circuit. Draw the timing diagram generated by simulating the verilog code. Assume 20 ns holding time of each input combination. **(06 Marks)**

2 a. Simplify the Boolean function F(A, B, C, D) = $\sum m(1, 3, 5, 7, 8, 10, 12, 14)$ by using Karnaugh map method and realize the logic circuit using only NAND gates. **(06 Marks)**

b. Draw Karnaugh map of Y = F(A, B, C, D) = $\Pi M(0, 1, 2, 4, 5, 10) \cdot d(8, 9, 11, 12, 13, 15)$ and get the simplified POS form of K-map. **(04 Marks)**

c. Get simplified expression of Y = F(A, B, C, D) = $\sum m(2, 3, 7, 9, 11, 13) + d(1, 10, 15)$ using Quine-McClusky method. **(10 Marks)**

3 a. What is a multiplexer? Design a 4-to-1 multiplexer using logic gates, write the truth table and explain its working principle. **(06 Marks)**

b. Describe the working principle of 3:8 decoder. Design a circuit that realizes the following functions using a 3 : 8 decoder and multi-input OR gates.
$F_1(A, B, C) = \sum m(1, 3, 7)$; $F_2(A, B, C) = \sum m(2, 3, 5)$ **(06 Marks)**

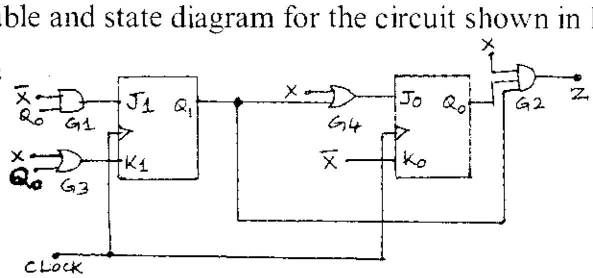
c. What is magnitude comparator? Design one bit comparator and write the truth table, logic circuit using basic gates. **(06 Marks)**

d. How does Programmable Logic Arrays (PLA) differ from a Programmable Array Logic (PAL)? **(02 Marks**

4 a. With the help of neat diagram, explain the working of edge triggered JK flip-flop. Write the state diagram and excitation table. **(06 Marks)**

b. What is switch contact bounce? Explain the working principle of a simple RS latch debounce circuit. **(04 Marks)**

c. Write the state table and state diagram for the circuit shown in Fig.Q4(c).



$G_1, G_2 \rightarrow$ AND gate
$G_3, G_4 \rightarrow$ OR gate

Fig.Q4(c) **(10 Marks)**

PART – B

5 a. What is a shift register? Draw the logic diagram of a 4 bit serial in serial out (SISO) shift register using negative edge triggered JK or D flip-flops and explain its operation with the waveform to shift the binary number 1010 into the register. **(08 Marks)**

b. Explain with logic diagram the use of 8-bit SISO shift register in serial addition of two 8-bit numbers. **(08 Marks)**

c. Write verilog HDL code for 4-bit SIPO shift register when all the flip-flop outputs are available externally. **(04 Marks)**

6 a. What are asynchronous and synchronous counters? With a neat block diagram, output waveform and truth table, explain a 3-bit binary ripple counter constructed using negative edge triggered JK flip-flops. **(10 Marks)**

b. Design a mod-5 counter using JK flip-flops having the feature that if an unused state appears, the counter will reset to 000 at the next clock pulse. **(10 Marks)**

7 a. With neat block diagrams compare Mealy model and Moore model of sequential logic system. **(04 Marks)**

b. Draw the ASM chart for the Mealy machine shown in Fig.Q7(b). **(08 Marks)**

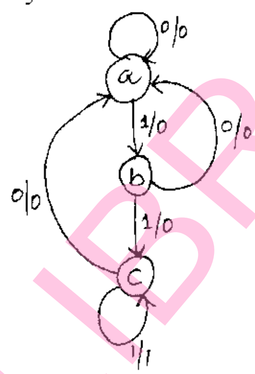


Fig.Q7(b)

c. Using row elimination method reduce the state diagram shown in Fig.Q7(c).

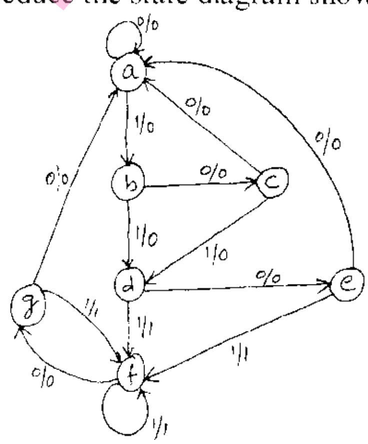


Fig.Q7(c). **(08 Marks)**

8 a. What is the binary ladder? Explain the binary ladder with a digital input of 1000. **(06 Marks)**

b. Define Accuracy and Resolution with respect to DAC. **(04 Marks)**

c. With a neat circuit diagram, explain parallel ADC. **(10 Marks)**

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Third Semester B.E. Degree Examination, June/July 2014

Discrete Mathematical Structures

Time: 3 hrs. Max. Marks:100

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

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 – A

1 a. For any three sets A, B, C, prove: $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$. **(06 Marks)**

b. Among the integers from 1 to 200, find the number of integers that are:
i) not divisible by 5
ii) divisible by 2 or 5 or 9
iii) not divisible by 2 or 5 or 9. **(07 Marks)**

c. A problem is given to four students A, B, C, D whose chances of solving it are 1/2, 1/3, 1/4, 1/5 respectively. Find the probability that the problem is solved. **(07 Marks)**

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

b. Define the dual of logical statement. Verify the principle of duality for the following logical equivalence: $[\neg(p \wedge q) \to \neg p \vee (\neg p \vee q)] \Leftrightarrow (\neg p \vee q)$. **(07 Marks)**

c. Define converse, inverse and contra-positive of a conditional with truth table. Write down the contra-positive of $[p \to (q \to r)]$ with:
i) only one occurrence of the connective $\to$
ii) no occurrence of the connective $\to$. **(07 Marks)**

3 a. Negate and simplify each of the following:
i) $\exists x, [p(x) \vee q(x)]$
ii) $\forall x, [p(x) \wedge \neg q(x)]$
iii) $\forall x, [p(x) \to q(x)]$ **(06 Marks)**

b. Establish the validity of the following argument:

$$\begin{array}{l} \forall x, [p(x) \vee q(x)] \\ \underline{\forall x, [\{\neg p(x) \wedge q(x)\} \to r(x)]} \\ \therefore \forall x, [\neg r(x) \to p(x)] \end{array}$$

(07 Marks)

c. Prove that every even integer n with $2 \le n \le 26$ can be written as a sum of atmost three perfect squares. **(07 Marks)**

4 a. Let $a_0 = 1$, $a_1 = 2$, $a_2 = 3$ and $a_n = a_{n-1} + a_{n-2} + a_{n-3}$ for $n \ge 3$. Prove that $a_n \le 3^n$ for all positive integers n. **(06 Marks)**

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

c. The Lucas numbers are defined recursively by $L_0 = 2$, $L_1 = 1$ and $L_n = L_{n-1} + L_{n-2}$ for $n \ge 2$. Evaluate L_2 to L_{10}. **(07 Marks)**

PART – B

5 a. Suppose A, B, C $\subseteq$ Z X Z with $A = \{(x, y)|y = 5x - 1\}$; $B = \{(x, y)|y = 6x\}$; $C = \{(x, y)|3x - y = -7\}$. Find: (i) $A \cap B$, (ii) $B \cap C$, (iii) $\overline{A \cup C}$, (iv) $\overline{B} \cup \overline{C}$. **(06 Marks)**

b. Define stirling number of second kind. Find the number of ways of distributing four distinct objects among three identical containers with some containers 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 $(h \circ g) \circ f = h \circ (g \circ f)$. **(07 Marks)**

6 a. Let $A = \{1, 2, 3, 4\}$, $B = \{w, x, y, z\}$ and $C = \{5, 6, 7\}$. Also, let R_1 be a relation from A to B, defined by $R_1 = \{(1, x), (2, x), (3, y), (3, z)\}$ and R_2 and R_3 be relations from B to C, defined by $R_2 = \{(w, 5), (x, 6)\}$, $R_3 = \{(w, 5), (w, 6)\}$. Find $R_1 \circ R_3$. **(06 Marks)**

b. Find the number of equivalence relations that can be defined on a finite set A with $|A| = 6$. **(07 Marks)**

c. For $A = \{a, b, c, d, e\}$, the Hasse diagram for the poset (A, R) is as shown below:

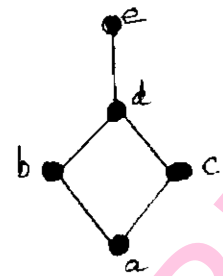

Fig.Q6(c)

i) Determine the relation matrix for R.
ii) Construct the diagraph for R. **(07 Marks)**

7 a. Define subgroup of a group. Let G be a group and let $J = \{ x \in G \mid xy = yx \text{ for all } y \in G\}$. Prove that J is a subgroup of G. **(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 = 0.02 is 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 $E : Z_2^3 \to Z_2^6$ is 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 transmission? **(06 Marks)**

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

c. Show that z_6 is not an integral domain. **(07 Marks)**

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Third Semester B.E. Degree Examination, June/July 2014
Data Structures 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 pointer? How pointers are declared and initialized in C? **(03 Marks)**

b. What is dangling pointer reference and how to avoid it? **(04 Marks)**

c. Estimate the space complexity of a recursive function for summing a list of numbers. **(05 Marks)**

d. Define the term "space and time complexity". Apply program step counter method to estimate the time complexity of a function to add two matrices. **(08 Marks)**

2 a. With a suitable example, explain dynamic memory allocation for 2-d arrays. **(04 Marks)**

b. Define a structure for the employee with the following fields : Emp_Id(integer), Emp_Name(string), Emp_Basic(float), Emp_Dept(string) and Emp_Age(integer). Write the following functions to process the employee data :

i) Function to read an employee record

ii) Function to print an employee record. **(08 Marks)**

c. Write the "fast transpose" algorithm of a sparse matrix. Why the name "fast transpose"? **(08 Marks)**

3 a. What is the advantage of circular queue over linear queue? Write the insert and delete functions for circular implementation of queues. **(08 Marks)**

b. Explain infix to postfix expression algorithm and trace it for an expression "a * (b + c) * d". **(08 Marks)**

c. How multiple stacks implemented using one dimensional array? Explain with a suitable example. **(04 Marks)**

4 a. Write the following functions for singly linked list :

i) Reverse the list ii) Concatenate two lists. **(08 Marks)**

b. Write the node structure for linked representation of polynomial. Explain the algorithm to add two polynomials represented using linked lists. **(08 Marks)**

c. What is the advantage of doubly linked list over singly linked list? Illustrate with an example. **(04 Marks)**

PART – B

5 a. Illustrate with a suitable example define :

i) Binary tree

ii) Degree of a binary tree

iii) Level of a binary tree

iv) Sibling. **(08 Marks)**

b. For any nonempty binary tree, T, if n_0 is the number of leaf nodes and n_2 the number of nodes of degree 2, then prove that $n_0 = n_2 + 1$. **(04 Marks)**

c. What is the advantage of threaded binary tree over binary tree? Explain threaded binary tree construction with a suitable example. **(08 Marks)**

6 a. What is binary search tree? Write a recursive search routine for a binary search tree. **(08 Marks)**

b. Explain selection trees, with suitable example. **(06 Marks)**

c. What is a forest? With a suitable example illustrate how you transform a forest into a binary tree. **(06 Marks)**

7 a. Define priority queue. List the single – ended and double-ended priority queue operations. **(06 Marks)**

b. Define the following :
   i) Leftist trees
   ii) Min leftist trees and
   iii) Weighted leftist trees. **(06 Marks)**

c. What is binomial heap? Explain the following associated with binomial heap :
   i) Insertion into a binomial heap
   ii) Melding two binomial heaps and
   iii) Deletion of min element. **(08 Marks)**

8 Write short notes on :

a. Optimal binary search trees
b. AVL trees
c. Red – black trees
d. Splay trees. **(20 Marks)**

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10CS36

Third Semester B.E. Degree Examination, June/July 2014

Object Oriented Programming with C++

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Compare object oriented programming with procedure oriented programming. **(06 Marks)**

b. Define function overloading. Write a C++ program to define overloaded functions to find volume of cube, volume of cylinder and volume of cuboid. **(08 Marks)**

c. With an example, explain when the set of overloaded functions can be combined into a single function definition by using default arguments. **(06 Marks)**

2 a. Define the terms class and object. Write a C++ program to define a class called distance with feet and inches as data members and get( ), put( ) and add( ) as members to read, display and add two distance objects. **(10 Marks)**

b. With an example, illustrate the characteristics of a constructor. **(05 Marks)**

c. Write a short note on destructors. **(05 Marks)**

3 a. With an example, explain the use of friend functions in C++. **(06 Marks)**

b. With an example, explain when to use member function and when to use friend function as an operator function for overloading binary operators. **(08 Marks)**

c. Write a C++ program to arrange set of integer and floating point values in ascending order by using a function template. **(06 Marks)**

4 a. With the help of syntax for creating the derived class, explain the visibility of the base class members, for the access specifiers private, protected and public. **(08 Marks)**

b. With an example, explain multiple inheritance. **(06 Marks)**

c. Explain the necessity of protected data members, with an example. **(06 Marks)**

PART – B

5 a. Explain the use of virtual base classes in diamond shaped inheritance. **(08 Marks)**

b. Explain the order of invocation of constructors and destructors in multilevel inheritance. **(08 Marks)**

c. Write a short note on use of scope resolution operator in inheritance. **(04 Marks)**

6 a. Define virtual function. Explain the need of a virtual function with an example. **(06 Marks)**

b. Write a C++ program to illustrate the virtual functions in hierarchical inheritance. **(08 Marks)**

c. Define abstract class. Write a C++ program to illustrate abstract class. **(06 Marks)**

7 a. Explain the following output manipulators:

i) setω( ) ii) setprecision( ) iii) setfill( ) **(06 Marks)**

b. Briefly explain the facilities available in fstream class for file operations. **(06 Marks)**

c. Write a C++ program to read a binary file, which contains the details of 5 students such as Name, rollno, age and grade obtained by the student. Display the above read details on the screen. **(08 Marks)**

8 a. What is exception handling? Write a C++ program to demonstrate the "try", "throw", and "catch" keywords for implementing exception handling. **(10 Marks)**

b. List and explain five member functions from vectors and lists classes in STL. **(10 Marks)**

USN

MATDIP301

Third Semester B.E. Degree Examination, June/July 2014
Advanced Mathematics – I

Time: 3 hrs. Max. Marks:100

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

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.

1 a. Find the modulus and amplitude of $\dfrac{5+3i}{4-2i}$ (06 Marks)

b. Prove that $(1+i)^n + (1-i)^n = 2^{\frac{n}{2}+1}\cos\dfrac{n\pi}{4}$ (07 Marks)

c. Prove that $\left(\dfrac{\cos\theta + i\sin\theta}{\sin\theta + i\cos\theta}\right)^4 = \cos 8\theta + i\sin 8\theta$ (07 Marks)

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

b. Find the n^{th} derivative of $\dfrac{x+3}{(x-1)(x+2)}$ (07 Marks)

c. If $y = a\cos(\log x) + b\sin(\log x)$, then prove that $x^2y_{n+2} + (2n+1)xy_{n+1} + (n^2+1)y_n = 0$ (07 Marks)

3 a. Find the angle of intersection of the curves $r = \sin\theta + \cos\theta$, $r = 2\sin\theta$. (06 Marks)

b. Find the pedal equation of the curve $r^n = a^n\cos n\theta$. (07 Marks)

c. Using Maclaurin's series expand $\log(1+\sin x)$ upto the term containing x^4. (07 Marks)

4 a. If $z = \dfrac{x^2+y^2}{x+y}$, then show that $\left(\dfrac{\partial z}{\partial x} - \dfrac{\partial z}{\partial y}\right)^2 = 4\left(1 - \dfrac{\partial z}{\partial x} - \dfrac{\partial z}{\partial y}\right)$ (07 Marks)

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

c. If $u = x + 3y^2 - z^3$, $v = 4x^2yz$, $w = 2z^2 - xy$, evaluate $\dfrac{\partial(u,v,w)}{\partial(x,y,z)}$ at $(1, -1, 0)$. (07 Marks)

5 a. Obtain the reduction formula for

$$I_n = \int_0^{\pi/2} \sin^n x \, dx$$

(06 Marks)

b. Evaluate $\displaystyle\int_0^{\pi}\int_{2\sin\theta}^{4\sin\theta} r^3 \, dr\, d\theta$ (07 Marks)

c. Evaluate $\displaystyle\int_{-1}^{1}\int_0^{z}\int_{x-z}^{x+z}(x+y+z)\,dx\,dy\,dz$ (07 Marks)

6 a. With usual notations, prove that

$$\beta(m,n) = \frac{\Gamma(m)\,\Gamma(n)}{\Gamma(m+n)}$$ **(06 Marks)**

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

c. Prove that $\beta(m, \frac{1}{2}) = 2^{2m-1}\,\beta(m, m)$ **(07 Marks)**

7 a. Solve $\frac{dy}{dx} = (4x + y + 1)^2$, if $y(0) = 1$. **(06 Marks)**

b. Solve $(x+1)\frac{dy}{dx} - y = e^{3x}(x+1)^2$ **(07 Marks)**

c. Solve $\left\{y\left(1+\frac{1}{x}\right) + \cos y\right\}dx + (x + \log x - x\sin y)dy = 0$ **(07 Marks)**

8 a. Solve: $(D^3 + D^2 + 4D + 4)y = 0$ **(06 Marks)**

b. Solve: $(D^2 - 5D + 1)y = 1 + x^2$ **(07 Marks)**

c. Solve: $\frac{d^2y}{dx^2} - 2\frac{dy}{dx} + 5y = e^{2x}\sin x$ **(07 Marks)**

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