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06MAT41

Fourth Semester B.E. Degree Examination, December 2012
Engineering Mathematics – IV

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Given that $\frac{dy}{dx} = x^2 + y^2$ and $y(0) = 1$, to find an approximate value of y at $x = 0.1$ and $x = 0.2$ by Taylor's series method. (06 Marks)
- b. Using Euler's modified method, solve for y at $x = 0.1$ if $\frac{dy}{dx} = \frac{y-x}{y+x}$, $y(0) = 1$, carryout three modifications. (07 Marks)
- c. Given $\frac{dy}{dx} = (1+y)x^2$ and $y(1) = 1$, $y(1.1) = 1.233$, $y(1.2) = 1.548$, $y(1.3) = 1.979$, determine $y(1.4)$ by Adams – Bash forth method. (07 Marks)
- 2 a. Show that an analytic function with constant modulus is constant. (06 Marks)
- b. Find the analytic function $f(z) = u + iv$, if $u = e^{-x} \{(x^2 - y^2) \cos y + 2xy \sin y\}$ (07 Marks)
- c. Find the bilinear transformation which maps the points $z = 1, i, -1$ into the points $w = i, 0, -i$ and hence find the image $|z| < 1$. (07 Marks)
- 3 a. Using the Cauchy's integral formula, to evaluate $\int_c \frac{\cos \pi z^2}{(z-1)(z-2)} dz$ where $c : |z| = 3$. (06 Marks)
- b. Obtain the Laurent's series for the function $f(z) = \frac{z^2 - 1}{z^2 + 5z + 6}$ in the regions i) $2 < |z| < 3$
ii) $|z| > 3$. (07 Marks)
- c. Determine the poles of $\frac{z^2}{(z-1)^2(z+2)}$ and the residues at each pole. (07 Marks)
- 4 a. Prove that $e^{\frac{x}{2}(t-\frac{1}{t})} = \sum_{n=-\infty}^{\infty} t^n J_n(x)$. (06 Marks)
- b. Show that $J_n(x) = \frac{x}{2n} \{J_{n+1}(x) + J_{n-1}(x)\}$ (07 Marks)
- c. Explain the polynomial $2x^3 - x^2 - 3x + 2$ in terms of Legendre's polynomials. (07 Marks)

PART – B

- 5 a. Fit a straight line to the following data: (06 Marks)

x:	0	1	2	3	4
y:	1.0	1.8	3.3	4.5	6.3

- 5 b. Prove that $\tan \theta = \left(\frac{1-r^2}{r} \right) \frac{\sigma_x \sigma_y}{\sigma_x^2 + \sigma_y^2}$, where γ , σ_x , σ_y have their usual meanings and explain the significance of $r = \pm 1$ and $r = 0$. (07 Marks)
- c. A certain problem is given to four students for solving. The probability of their solving the problem are $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ and $\frac{1}{5}$ respectively. Find the probability that the problem is solved. (07 Marks)
- 6 a. The probability density function $P(x)$ of a continuous random variables is given by, $P(x) = y_0 e^{-|x|}$, $-\infty < x < \infty$, prove that $y_0 = \frac{1}{2}$. Find the mean and variance of the distribution. (06 Marks)
- b. Derive the mean and variance of the binomial distribution. (07 Marks)
- c. If x is an exponential variate with mean 4, evaluate i) $P(0 < x < 1)$ ii) $P(x > 2)$ and iii) $P(-\infty < x < 10)$. (07 Marks)
- 7 a. Define the terms: i) Null hypothesis ii) Level of significance and iii) Confidence limits. (06 Marks)
- b. A sugar factory is expected to sell sugar in 100 kg bags. A sample of 144 bags taken from a day's output shows the average and S.D. of weights of these bags as 99 and 4 kg respectively. Can we conclude that the factory is working as per standards? (Table value of $z = 1.96$ at 5% Log) (07 Marks)
- c. The following table gives the number of aircraft accidents that occurred during the various days of the week. Find whether the accident are uniformly distributed over the week. ($X_{0.05}^2 = 9.41$ for 4 d.f.) (07 Marks)

Day	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Total
No. of accident	14	16	8	12	11	9	14	84

- 8 a. The joint probability distribution for the following table:

x \ y	2	3	4
1	0.06	0.15	0.09
2	0.14	0.35	0.21

Determine the marginal distribution of x and y and verify that x and y are independent variables. (06 Marks)

- b. Find the fixed probability vector of the following regular stochastic matrix.

$$A = \begin{bmatrix} \frac{1}{2} & \frac{1}{4} & \frac{1}{4} \\ \frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 1 & 0 \end{bmatrix}$$

(07 Marks)

- c. Define the following terms:

i) Regular state ii) Periodic state iii) Recurrent state and iv) Transient state.

(07 Marks)

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06CS42

Fourth Semester B.E. Degree Examination, December 2012
Graph Theory and Combinatorics

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a.** Seven towns a, b, c, d, e, f and g are connected by a system highways as follows:
- NH – 22 goes from a to c, passing through b.
 - NH – 33 goes from c to d and then passes through b as it continues to f.
 - NH – 55 goes from f to b passing through g.
 - NH – 44 goes from d through e to a.
 - NH – 66 goes from g to d.
- Using vertices for towns and directed edges for highways between towns, draw a directed graph that models this situation.
 - List the paths from g to a.
 - Is it possible to leave town c and return there visiting each of the other towns only once?
 - What is the smallest number of highway segments that would have to be closed down in order for travel from b to d to be disrupted?
 - What is the answer to part (3) if we are not required to return to c? (12 Marks)
- b.** Find the maximum length of i) A tree and ii) A circuit for the complete graphs K_8 and K_{10} . (08 Marks)
- 2 a.** Let $X = \{1, 2, 3, 4, 5\}$ construct the loop free undirected graph $G = (V, E)$ such that,
 (V) : Let each two element subset of X represents a vertex in G.
 (E) : If $v_1, v_2 \in V$ correspond to subsets $\{a, b\}$ and $\{c, d\}$ respectively, of X, then draw the edge $\{v_1, v_2\}$ in G if $\{a, b\} \cap \{c, d\} = \emptyset$. (06 Marks)
- b.** Let $G = (V, E)$ be a loop free graph with $|V| = n \geq 3$. If $\deg(x) + \deg(y) \geq n$ for all non adjacent $x, y \in V$, then G contains a Hamilton cycle. (06 Marks)
- c.** For $n \geq 3$, let c_n denote the cycle of length n,
- What is the chromatic polynomial $P(c_3, \lambda)$?
 - Establish the relationships $P(c_n, \lambda) - (\lambda - 1)^n = (\lambda - 1)^{n-1} - P(c_{n-1}, \lambda)$, $P(c_n, \lambda) - (\lambda - 1)^n = P(c_{n-2}, \lambda) - (\lambda - 1)^{n-2}$ for $n \geq 5$ for $n \geq 4$.
 - Prove that for all $n \geq 3$, $P(c_n, \lambda) = (\lambda - 1)^n + (-1)^n (\lambda - 1)$. (08 Marks)

Important Note : 1. On completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages.
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- 3 a. Find the depth first spanning tree for the graph shown in Fig.Q.3(a) if the order of the vertices is given as
 i) a, b, c, d, e, f, g, h
 ii) a, b, c, d, h, g, f, e

(06 Marks)

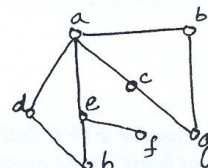


Fig.Q.3(a)

- b. For every tree $T = (V, E)$, if $|V| \geq 2$ show that T has at least two pendent vertices. (06 Marks)
 c. Suppose that a tree T has two vertices of degree 2, four vertices of degree 3 and three vertices of degree 4. Find the number of pendent vertices in T . (08 Marks)
- 4 a. Apply Dijkstra's algorithm to the weighted directed multigraph shown in Fig.Q.4(a). Find the shortest distance from the vertex a to the other seven vertices in the graph. (08 Marks)

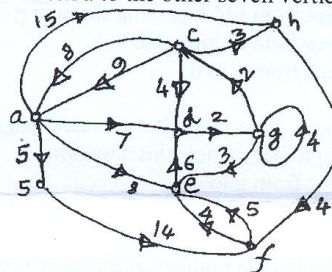


Fig.Q.4(a)

- b. For the graph shown in Fig.Q.4(b), if four edges are selected at random, what is the probability that they provide a complete matching of X into Y ? Where $X = \{c_1, c_2, c_3, c_4\}$ and $Y = \{s_1, s_2, s_3, s_4, s_5\}$. (04 Marks)
 c. Define the following terms with respect to a bipartite graph with V partitioned as XUY bipartite graph.
 i) A maximal matching in G .
 ii) The deficiency of graph G .
 iii) A complete matching in G .

(04 Marks)

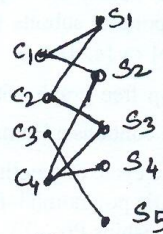


Fig.Q.4(b)

- d. What is a system of distinct representatives? Determine all systems of distinct representatives for collection of sets. $A_1 = \{1, 2\}$, $A_2 = \{2, 3\}$, $A_3 = \{3, 4\}$, $A_4 = \{4, 1\}$. (04 Marks)

PART – B

- 5 a. Maruti cars in 4 models, 12 colors, 3 engine types and 2 transmission types. How many distinct Maruti cars can be manufactured? Of these how many have the same color? (06 Marks)
- b. In how many possible ways could a student answer a 10 question TRUE/FALSE test? (04 Marks)
- c. In how many ways can we distribute 8 identical balls into 4 distinct containers so that,
 i) No container is left empty.
 ii) The fourth container has an odd number of balls in it. (10 Marks)
- 6 a. In how many ways can 3 x's, 3 y's and 3 z's be arranged so that no consecutive triple of the same letter appears? (06 Marks)
- b. Sheela has 7 books to review for the ABC company, so she hires 7 people to review them. She wants two reviews per book, so the first week she gives each person 1 book to read and then redistributes the books at the start of the second week. In how many ways can she make these two distributions so that she gets 2 reviews of each book? (06 Marks)
- c. In how many ways can one distribute 10 distinct prizes among 4 students with exactly 2 students getting nothing? How many ways have at least two students getting nothing? (08 Marks)
- 7 a. Determine the coefficient of x^8 in $\frac{1}{(x-3)(x-2)^2}$. (10 Marks)
- b. Find a formula to express $0^2 + 1^2 + 2^2 + \dots + n^2$ as a function of n. (10 Marks)
- 8 a. Find a recurrence relation for the number of binary sequences of length n that have no consecutive 0s. (06 Marks)
- b. Solve the recurrence relation $a_n = 2(a_{n-1} - a_{n-2})$ where $n \geq 2$ and $a_0 = 1, a_1 = 3$. (08 Marks)
- c. Solve the following recurrence relations by the method of generating functions
 $a_{n+1} - a_n = n^2, n \geq 0, a_0 = 1$. (06 Marks)

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06CS43

Fourth Semester B.E. Degree Examination, December 2012
Analysis and Design of Algorithms

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Define the term algorithm. Briefly explain a sequence of steps performed in designing and analyzing an algorithm. (12 Marks)
- b. Discuss any six important problem types. Give example for each. (08 Marks)
- 2 a. Define big – oh, omega and theta notations for analyzing algorithms. Give atleast two examples for each. (12 Marks)
- b. Design an algorithm for checking whether all elements in a given array are distinct or not. What is its time complexity? (08 Marks)
- 3 a. Sort the following list 66, 55, 43, 32, 21 using selection sort in ascending order. Show that its complexity is $O(n^2)$. (10 Marks)
- b. Explain the concept of divide and conquer. Design an algorithm for merge sort. (10 Marks)
- 4 a. How two matrices are multiplied using Strassen's multiplication method? List all the intermediate formulas. (10 Marks)
- b. Design an algorithm for DFS. How is it differs from BFS method. (10 Marks)

PART – B

- 5 a. What is heap? Develop an algorithm for heap sort method. Determine its time complexity. (10 Marks)
- b. Develop an algorithm for "comparison counting sort" sort the following list 62, 31, 84, 96, 19, 47 in ascending order using the same method. (10 Marks)
- 6 a. Write a note on closed and open hashing taking, suitable examples. (10 Marks)
- b. Design an algorithm for solving all pair shortest path problem. Find shortest paths for the given graph represented in adjacency matrix. (10 Marks)

	a	b	c	d
a	0	∞	3	∞
b	2	0	∞	∞
c	∞	7	0	1
d	6	∞	∞	0

(10 Marks)

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- 7 a. Design an algorithm for Kruskal's method. Find a minimum spanning tree for the following graph. (12 Marks)

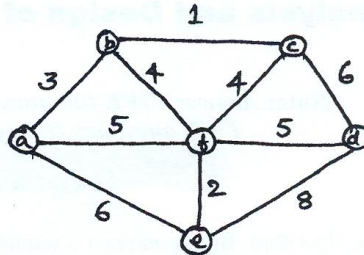


Fig. Q7(a)

- b. Design an algorithm for single source shortest path problem. (08 Marks)
- 8 a. Define P, NP and NP – complete problems. How NP –complete is proved? (10 Marks)
- b. What is meant by back tracking? Illustrate 4 – queen's problem. (10 Marks)

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06CS44

Fourth Semester B.E. Degree Examination, December 2012

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. Explain any four characteristics of OOPs. (08 Marks)
- b. What are the advantages of inline functions? Write a C++ program to find greater of 3 numbers using inline function. (06 Marks)
- c. With syntax and example, explain necessity of function prototype. (06 Marks)
- 2 a. How friend functions are different from member function? Write a program to add two data members of different classes using friend function. (08 Marks)
- b. Explain with a syntax and example the structure of C++ program. Write a c++ program to find average marks scored in three subjects using arrays of object. (08 Marks)
- c. Explain the importance of static data member with an example. (04 Marks)
- 3 a. With syntax and example, explain dynamic memory management operators in C++. (04 Marks)
- b. Explain the use of this pointer with an example. (04 Marks)
- c. What are the characteristics of constructors? Define a class called distance with feet and inches as data members. Write a C++ program to add two distances by overloading constructors. (12 Marks)
- 4 a. What is a derived class? Explain with an example, the three ways in which a class can be inherited. (08 Marks)
- b. Explain multiple and diamond shaped inheritance with an example. (08 Marks)
- c. Explain how pointers are used in base and derived class with an example. (04 Marks)

PART – B

- 5 a. Differentiate between function overloading and function overriding. (04 Marks)
- b. What is runtime polymorphism? How virtual functions are used to implement the run time polymorphism? Explain with an example. (10 Marks)
- c. Write a note on I/O stream classes in C++. (06 Marks)
- 6 a. Explain any five file handling functions in C++. (10 Marks)
- b. Explain the following manipulators:
i) Set w () ii) Set fill () iii) Set precision () (06 Marks)
- c. What is operator overloading? List the operators that cannot be overloaded. (04 Marks)
- 7 a. Explain with syntax the operator () function. (04 Marks)
- b. Explain with an example, how to overload unary minus and binary + operators. (08 Marks)
- c. Write a C++ program to compare two strings are equal or not by overloading = operator and display the result by overloading < < operator. (08 Marks)
- 8 a. Define function templates. Discuss the need of function template, with a suitable example. (10 Marks)
- b. Explain new style cast operators in C++. (10 Marks)

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06CS45

Fourth Semester B.E. Degree Examination, January 2013
Microprocessors

Time: 3 hrs.

Max. Marks:100

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

PART – A

- 1 a. Explain the internal architecture of 8086, with a neat diagram. (10 Marks)
b. Explain various addressing modes of 8086, with suitable instructions. (10 Marks)
- 2 a. Write and explain instruction template for MOV instruction. Find out machine code for the following instruction, the opcode for MOV is

1	0	0	0	1	0		
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i) MOV CL, [SI] ii) MOV 46H[BP], DX iii) MOV AX, BX (10 Marks)
b. With the flag register format, explain the status flags of 8086. (05 Marks)
c. Explain the significance of special bit indicator available in 8086. (05 Marks)
- 3 a. Write an ALP to find largest of the given numbers. (06 Marks)
b. Explain about unconditional jump instruction. (10 Marks)
c. Write ALP to generate a delay of 0.5 ms using 8086 that runs on 5 MHz frequency. (04 Marks)
- 4 a. Explain the following:
i) movsw ii) lodsw iii) stosb iv) cmps v) scasb (10 Marks)
b. With suitable examples, explain the repeat prefixes available in 8086. (06 Marks)
c. Define macro with example. (04 Marks)

PART – B

- 5 a. Explain the following with example of each:
i) AAA ii) AAD iii) RCL iv) Loop v) Ret (10 Marks)
b. In brief, explain the different types of assembly directives. (10 Marks)
- 6 a. Explain with neat timing diagram, the bus activities during a memory read & write machine cycle. (10 Marks)
b. Explain with neat diagram, for 8086 base micro computer. (10 Marks)
- 7 a. Explain the action taken by 8086 microprocessor when an interrupt occurs. Describe interrupt vector table (IVT). (10 Marks)
b. What are the different types of interrupts? Explain briefly. (10 Marks)
- 8 a. Write an interfacing circuit to connect 8-bit ADC to microprocessor using 8255. Write a program to initialize 8255, initiate start of conversion, check end of conversion and after conversion is completed read 1 byte of data from ADC. (10 Marks)
b. With a neat block diagram, explain the functioning of 8255 PPI. (10 Marks)

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06CS46

Fourth Semester B.E. Degree Examination, January 2013
Computer Organization

Time: 3 hrs.

Max. Marks:100

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

PART – A

1. a. Explain the block diagram of connections between the processor and the memory, and explain how the following typical instructions can be executed with relevant steps :
 - i) Move NUM1, R₂
 - ii) Add R₃, NUM2. (10 Marks)
 b. What is a bus? Explain the single bus structure used to interconnect functional units in computer system. (04 Marks)
- c. Convert the following pairs of signed decimal number to 5 bit, signed, is complement binary numbers and add them. State whether over flow occurs or not in each case
 - i) 8 and 15
 - ii) -12 and -2
 - iii) -6 and 8. (06 Marks)
2. a. What is an addressing mode? Explain the following addressing modes, with an example for each :
 - i) Immediate addressing mode
 - ii) Indirect addressing mode
 - iii) Autoincrement addressing mode
 - iv) Relative addressing mode. (10 Marks)
 b. For a simple example of I/O operations involving a key board and a display device, write an assembly language program that reads one line of characters from the key board, stores it in memory buffer and echoes it back to the display. (05 Marks)
- c. What is stack? Explain its role in subroutine nesting. (05 Marks)
3. a. Explain the important functions of an I/O interface, with a neat block diagram. (05 Marks)
- b. Explain with a neat diagram, how interrupt request from several I/O processor through a single INTR line. (05 Marks)
- c. What is DMA? Explain the hardware registers that are required in a DMA controller chip. Explain the use of DMA controller in a computer system, with a neat diagram. (10 Marks)
4. a. With a neat block diagram, explain a general 8 – bit parallel interface circuit. (10 Marks)
- b. Discuss the main phases involved in the operation of SCSI bus in detail, with an example. (10 Marks)

PART – B

5. a. Explain the synchronous DRAM, with the aid of a block diagram. (10 Marks)
- b. With a simple arrangement of cache memory, explain how time required for main memory accesses can be reduced. (06 Marks)
- c. Define Hit Rate and Miss Penalty. (04 Marks)

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- 6 a. With a block diagram, explain the virtual memory organization. (07 Marks)
b. List and explain four major functions of disk controller. (05 Marks)
c. Explain the design of a 4 – bit carry – look ahead adder, with a neat diagram. (08 Marks)
- 7 a. Using a block diagram, which shows the register configuration, perform sequential circuit binary multiplication of multiplicand = 1010 and multiplier = 1101. (08 Marks)
b. Write and explain the algorithm for binary division using restoring division method, with an example. (06 Marks)
c. Explain the IEEE standard for floating point number representation. (06 Marks)
- 8 a. Briefly explain the single bus organization of the data path inside a processor, with a neat block diagram. (08 Marks)
b. Write and explain the control sequences for execution of following instruction, Add R₂, (R₄). (06 Marks)
c. Explain with neat block diagram, the basic organization of a microprogrammed control unit. (06 Marks)

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