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06MAT41

Fourth Semester B.E. Degree Examination, December 2011
Engineering Mathematics – IV

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Given $\frac{dy}{dx} = \frac{1}{1+x^2} - 2y^2$, y(0) = 0. Find y(0.5) in two steps, using the modified Euler's method. **(07 Marks)**

b. Using the Runge-Kutta method of fourth order find y(0.2) for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, y(0) = 1, taking h = 0.1. **(07 Marks)**

c. Given $2dy/dx = (1+x^2)y^2$ and y(0) = 1, y(0.1) = 1.06, y(0.2) = 1.12, y(0.3) = 1.21. Evaluate y(0.4) by Milne's method. **(06 Marks)**

2 a. Obtain the necessary conditions in the Cartesian system, for a function f(z) to be analytic in a region R. **(07 Marks)**

b. Find the analytic function f(z) = u + iv, given $u - v = e^x(\cos y - \sin y)$. **(07 Marks)**

c. Find the bilinear transformation that maps the points 0, -i, -1 of z-plane onto the points i, 1, 0 of w-plane respectively. **(06 Marks)**

3 a. State and prove Cauchy's integral formula. **(07 Marks)**

b. Obtain the power series which represents the function $f(z) = \frac{z^2-1}{z^2+5z+6}$, in the following regions: i) $|z| < 2$ ii) $2 < |z| < 3$ iii) $|z| > 3$ **(07 Marks)**

c. Using the Cauchy's residue theorem, evaluate the integral $\int_C \frac{z^2}{(z-1)^2(z+2)}dz$, where c is the circle $|z| = 5/2$. **(06 Marks)**

4 a. Solve in series the equation, $\frac{d^2y}{dx^2} + x^2y = 0$. **(07 Marks)**

b. Solve the Bessel's equation of order n given by, $x^2\frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$ where n is a non-negative real constant. **(07 Marks)**

c. With the usual notations, show that

$$x^4 - 3x^2 + x = \frac{8}{35}P_4(x) - \frac{10}{7}P_2(x) + P_1(x) - \frac{4}{5}P_0(x)$$ **(06 Marks)**

PART – B

5 a. The pressure and volume of a gas are related by the equation $PV^\gamma = k$, γ and k being constants. Fit this equation for the following set of observations:

P(kg/cm^2)	0.5	1.0	1.5	2.0	2.5	3.0
V(litres)	1.62	1.00	0.75	0.62	0.52	0.46

(07 Marks)

b. While calculating correlation coefficient between two variables x and y from 25 pairs of observations, the following results were obtained:

$n = 25$, $\Sigma x = 125$, $\Sigma x^2 = 650$, $\Sigma y = 100$, $\Sigma y^2 = 460$, $\Sigma xy = 508$.

Later it was discovered at the time of checking that the pairs of values.

x	y
8	12
6	8

were copied down as

x	y
6	14
8	6

Obtain the correct value of correlation coefficient. **(07 Marks)**

c. A box contains 500 IC chips of which 100 are manufactured by company X and the rest by company Y. It is estimated that 10% of the chips made y company X and 5% made by company Y are defective. If a randomly selected chip is found to be defective, find the probability that it came from company X. **(06 Marks)**

6 a. A die is tossed thrice. A success is getting 1 or 6 on a toss. Find the mean and variance of the number of successes. **(07 Marks)**

b. For the Poisson distribution, prove that, $P(r) = \frac{e^{-m}m^r}{r!}$, where m is the mean of distribution. **(07 Marks)**

c. Fit a normal distribution to the following data:

x :	1	3	5	7	9
y :	2	2	3	2	1

(06 Marks)

7 a. Explain the meanings of i) Null hypothesis type-I and type-II errors ii) Level of significance. **(07 Marks)**

b. Eleven school boys were given a test in drawing. They were given months further tuition and a second test of equal difficulty was held at the end of it. Do the following marks give evidence that the students have benefited by extra coaching? **(07 Marks)**

Boys	1	2	3	4	5	6	7	8	9	10	11
Marks I test	23	20	19	21	18	20	18	17	23	16	19
Marks II test	24	19	22	18	20	22	20	20	23	20	17

c. A survey of 64 families with 3 children each is conducted and the number of male children in each family is noted. The results are tabulated as follows:

Male children	0	1	2	3	Total
Families	6	19	29	10	64

Apply Chi-square test of goodness of fit to test whether male and female children are equiprobable. **(06 Marks)**

8 a. Compute i) $P(x = 1, y = 2)$ ii) $P(x \geq 1, y \leq 2)$ iii) $P(x \leq 1, y \leq 2)$ iv) $P(x + y \geq 2)$, using the following joint probability distribution for x and y. **(07 Marks)**

x \ y	0	1	2	3	Sum
0	0	1/8	1/4	1/8	1/2
1	1/8	1/4	1/8	0	1/2
Sum	1/8	3/8	3/8	1/8	1

b. Discuss : i) Absorbing state ii) Transient state iii) Recurrent state iv) Periodic state. **(07 Marks)**

c. A software engineer goes to his work place every day by motor bike or by car. He never goes by bike on two consecutive days but it he goes by car on a day then he is equally likely to go by car or by bike on the next day. Find the transition matrix for the chain of the mode of transport he uses. If car is used on the first day of week, find the probability that i) bike is used ii) car is used on the fifth day. **(06 Marks)**

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06CS42

Fourth Semester B.E. Degree Examination, December 2011
Graph Theory and Combinatorics

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define regular graph. Draw a graph which has 10 – vertices and 15 edges and which should be a 3 – regular graph. **(04 Marks)**

b. Define isomorphism of graphs. Determine whether the following graphs are isomorphic. **(06 Marks)**

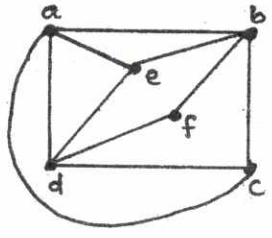
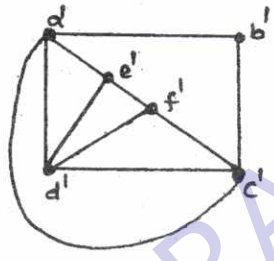


Fig. Q1(b)



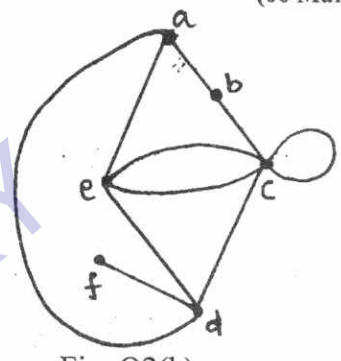


Fig. Q2(b)

c. If G is a graph with n – vertices and m – edges, let δ be the minimum and Δ be the maximal local degree, then prove that $\delta \leq \frac{2m}{n} \leq \Delta$. **(05 Marks)**

d. Give the comparison between Euler graph and Hamiltonian graph. **(05 Marks)**

2 a. Define complete bipartite graph. Prove that Kuratowski's second graph $K_{3,3}$ is nonplanar. **(07 Marks)**

b. Find the geometric dual of the following graph. **(07 Marks)**

c. Define chromatic number. Prove that a graph of order n($\geq$ 2) consisting of a single circuit is 2 – chromatic if n is even, and 3 – chromatic if n is odd. **(06 Marks)**

3 a. Define a tree. Prove that a tree with n –vertices has exactly (n – 1) edges. **(07 Marks)**

b. A tree has N_1 vertices of degree 1, N_2 vertices of degree 2, N_3 vertices of degree 3 and so on N_k vertices of degree k. prove that $N_1 = 2 + N_3 + 2N_4 + 3N_5 + \ldots + (k-2)N_k$. **(06 Marks)**

c. Obtain an optimal prefix code for the message "FALL OF THE WALL". **(07 Marks)**

4 a. Find a minimal spanning tree for the following graph using KRUSKAL'S algorithm. **(07 Marks)**

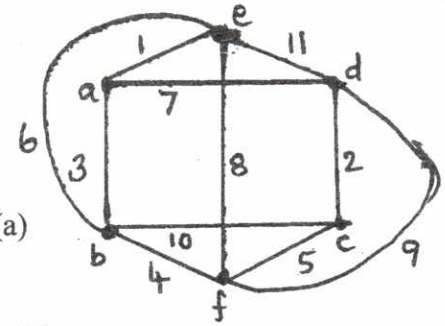


Fig. Q4(a)

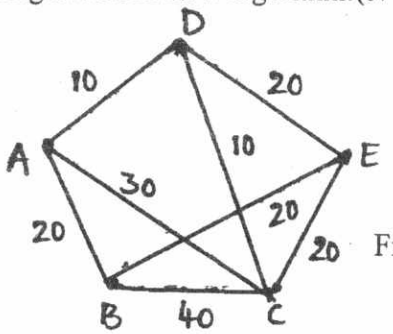


Fig. Q4(c)

b. Define matching, complete matching, cutest of a graph. Give one example for each. **(06 Marks)**

c. Explain the max–flow–min–cut theorem, apply this to network shown in Fig. Q4(c) to find the maximum flow possible between the vertices A and E. **(07 Marks)**

PART – B

5 a. Determine the number of 6 – digit integers (no leading 0's) in which
   i) No digit is repeated
   ii) No digit is repeated and it is even
   iii) No digit is repeated and it is divisible by 5. **(08 Marks)**

b. Find the number of distinct terms in the expansion of $(w + x + y + z)^{12}$. **(05 Marks)**

c. i) Show that $b_{n+1} = \frac{2(2n+1)}{(n+2)} b_n$, where b_n is the n^{th} Catalan number.

ii) In how many ways can three semi–circles (can be of varying size) be drawn on a horizontal line so that the semi–circles do not intersect? Illustrate the various cases. **(07 Marks)**

6 a. In how many ways can 4a's, 3b's and 2c's be arranged so that all identical letters are not in a single block? **(07 Marks)**

b. Define derangement. In how many ways can the integers 1, 2, 3, 4, 5 be deranged? List those derangement where the first three numbers are 1, 2 and 3in some order. **(07 Marks)**

c. Obtain the rook polynomial for the following chessboard. **(06 Marks)**

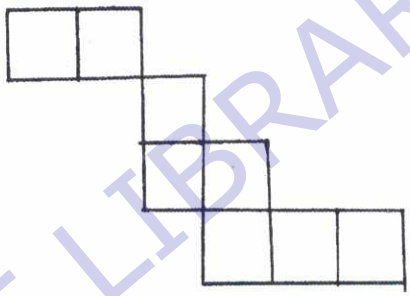


Fig. Q6(c)

7 a. In how many ways can two dozen identical robots be assigned to four assembly lines with
   i) Atleast three robots assigned to each line
   ii) Atleast three but not more than nine robots assigned to each line. **(08 Marks)**

b. Show that the number of partitions of a positive integer n. where no summand appears more than twice equals the number of partitions of n, where no summand is divisible by 3. **(06 Marks)**

c. i) Find the exponential generating function for the sequence
   0!, 1!, 2!, 3! . . . . and for a, a^3, a^5, a^7, ... a > 0
   ii) Determine the sequence generated by the exponential generating function $3e^{3x}$. **(06 Marks)**

8 a. Solve the recurrence relation
   $2a_n = 7a_{n-1} - 3z_{n-2}$, $n \geq 2$ and $a_0 = 2$, $a_1 = 5$. **(06 Marks)**

b. Solve the recurrence relation
   $a_{n+2} - 8a_{n+1} + 16a_n = 8(5^n) + 6(4^n)$
   where, $n \geq 0$ and $a_0 = 12$, $a_1 = 5$. **(08 Marks)**

c. By the method of generating function solve
   $a_{n+1} - a_n = 3^n$, $n \geq 0$, $a_0 = 1$. **(06 Marks)**

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06CS43

Fourth Semester B.E. Degree Examination, December 2011
Analysis and Design of Algorithms

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With the help of a flowchart, explain in detail, the various stages of algorithm design and analysis process. **(10 Marks)**

b. Explain the analysis framework of algorithms. Explain the worstcase, bestcase and average case efficiencies, with an algorithm. **(10 Marks)**

2 a. Explain the concept of asymptotic notations and basic efficiency classes, with examples. Explain 0, θ, and Ω, with examples. **(10 Marks)**

b. Explain the general plan for analyzing the efficiency of a recursive algorithm. Suggest a recursive algorithm to find factorial of a number. Derive its efficiency. **(10 Marks)**

3 a. Explain the brute force method for algorithm analysis and design. Explain the brute force string matching algorithm, with an example. Give its efficiencies. **(10 Marks)**

b. Explain the binary searching algorithm in detail, with an example. Show that worst case efficiency of binary search is in θ(log n). **(10 Marks)**

4 a. What is decrease and conquer? Give an example. Describe the insertion sort algorithm. The data elements [89, 45, 68, 90, 29, 34, 17] sort in the ascending order, using the same algorithm. **(10 Marks)**

b. Explain the DFS algorithm in detail, with an example. Give the differences between DFS and BFS. **(10 Marks)**

PART – B

5 a. Explain the transform and conquer in detail, with an example. Construct an AVL tree and 2–3 tree for the i/p sequence 1, 2, 3, 4, 5, 6 with the neat tree diagram. Explain the AVL tree and 2–3 trees. **(10 Marks)**

b. Explain the Horspool's string matching algorithm for a text that comprises English letters and spaces (denoted by underscore) with a pattern BARBER. Explain all the cases of Horspool algorithm and give its efficiency. **(10 Marks)**

6 a. Explain the dynamic programming with Floyd's algorithm in detail. Apply Floyd's all pair shortest path problem for the digraph given below, in Fig. Q6(a). **(10 Marks)**

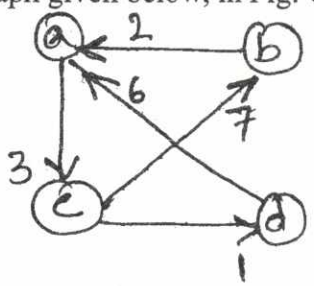

Fig. Q6(a)

b. Explain Hashing. Explain the open addressing method of hashing to insert the text "A FOOL AND HIS MONEY ARE SOON PARTED" in a hash table and delete the word "SOON" from the i/p data [Hash table size = 13]. **(10 Marks)**

7 a. Explain the concept of greedy technique with Prim's algorithm. Obtain minimum cost spanning tree for the graph below, using Prim's algorithm. **(10 Marks)**

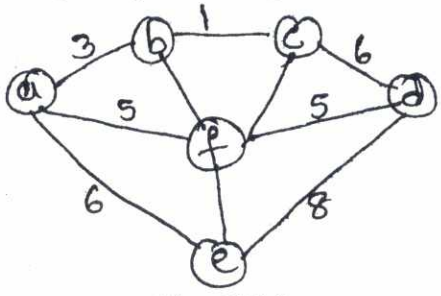

Fig. Q7(a)

b. What are Huffman trees? Explain. Give the different types of Huffman encoding. Construct a Huffman code for the following data. **(10 Marks)**

Character	A	B	C	D	–
Probability	0.4	0.1	0.2	0.15	0.15

Encode the following code, using Huffman encoding : ABCD–ABAC

8 a. What are P,NP, NP – complete problems? Give examples. Explain the backtracking, with an example. **(10 Marks)**

b. Explain the branch and bound, with an example. Solve the following Knapsack problem, using branch and bound. **(10 Marks)**

Item	1	2	3	4
Weight	2	1	3	2
Value	$ 12	$ 10	$ 20	$ 15

Capacity w = 5

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06CS44

Fourth Semester B.E. Degree Examination, December 2011
Object Oriented Programming with C++

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Explain the different features of object oriented programming. **(10 Marks)**
b. What is 'This' pointer? Explain its significance, with an example. **(05 Marks)**
c. Explain function overloading, with examples. **(05 Marks)**

2 a. Define the terms classes and objects, with examples. **(05 Marks)**
b. Write a C++ program to define a class called cuboide with length, breadth and height as data members and input( ), output( ), volume( ), and surface_area( ) as member functions. **(10 Marks)**
c. Explain how Namespace enables the C++ programmer to prevent pollution of global Namespace. **(05 Marks)**

3 a. Explain how 'new' and 'delete' operators manage the memory allocation / deallocation dynamically, with example. **(08 Marks)**
b. What are constructors and destructors? What are their characteristics? Explain different types of constructors. **(12 Marks)**

4 a. What is inheritance? Explain the different types of inheritance, with suitable diagrams. **(10 Marks)**
b. Explain the function overriding, with an example. **(04 Marks)**
c. Write a C++ program to initialize base class members through derived class constructors. **(06 Marks)**

PART – B

5 a. What is virtual function? Explain the mechanism of virtual function. **(08 Marks)**
b. Explain with a neat diagram, the class hierarchy for handling streams in C++. **(08 Marks)**
c. Explain the pure virtual function, with syntax. **(04 Marks)**

6 a. Explain the different error handling flags and function, with respect to files. **(08 Marks)**
b. What is operator overloading? What are the rules to be followed while overloading? **(08 Marks)**
c. Give the prototype and the usage of setw( ) and setfill( ) IO manipulator function, with an example. **(04 Marks)**

7 a. Create a class 'Time', with data members hours and minutes as integers, use appropriate constructors to initlize data members, overload the operator +, –, << and >> for adding subtracting, output and input operation. **(10 Marks)**
b. List the operators that can not be overloaded. Overload the 'new' and 'delete' operator for allocation/ deallocation of memory for single and array of objects. **(10 Marks)**

8 a. What is RTTI? Explain with examples, different types of new style casts in C++. **(08 Marks)**
b. What is a function template? Write a C++ program to implement array representation of Queues for integer and float, using template classes. **(12 Marks)**

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06CS45

Fourth Semester B.E. Degree Examination, December 2011
Microprocessors

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define microprocessor. With a neat block diagram, explain the overview of microcomputer. **(06 Marks)**

b. What is flag register? Explain the flag register format, in detail **(06 Marks)**

c. List and explain the addressing modes supported by 8086. **(08 Marks)**

2 a. Is coding the instruction for 16-bit processor is difficult? Give reasons. **(04 Marks)**

b. Generate the machine equipment code for the following 8086 instruction:
MOV CS:[BX], DL **(06 Marks)**

c. Explain the assembly language programming development tools. Write the algorithm for each. **(10 Marks)**

3 a. Write an assembly level program to convert two ASCII codes to packed BCD numbers. **(06 Marks)**

b. What is the need for unconditional jump instructions? Explain the different unconditional jump instructions, supported by 8086. **(08 Marks)**

c. Write a delay loop, which produces a delay of 500μs on 8086 microprocessor, with 5 MHz clock. **(06 Marks)**

4 a. Explain the string instructions supported by 8086. **(08 Marks)**

b. Write an assembly level program to check a given string is pallendrome or not, using the string instruction. **(08 Marks)**

c. Define and differentiate between reentrant and recursive procedures. **(04 Marks)**

PART – B

5 a. What is effect of using the following instructions or directives in 8086 programming:
i) GLOBAL ii) CALL iii) LAHF iv) TYPE v) NEG
vi) DQ vii) LEA viii) TEST ix) GROUP x) XLAT **(10 Marks)**

b. Write an assembly level program to find the binomial-coefficient, using recursion. **(10 Marks)**

6 a. Write and explain all the signal activities on 8086 buses, during a simple read operation. **(10 Marks)**

b. What is the need for memory banking? With a neat block diagram, explain the memory banking, in 8086. **(10 Marks)**

7 a. List and explain the hardware interrupt applications. **(08 Marks)**

b. With a neat block diagram, explain the 8259A system connections. **(09 Marks)**

c. List the differences between 8086 and 8088. **(03 Marks)**

8 a. With a neat block diagram, explain the internal block diagram of 8255A. **(08 Marks)**

b. Design a control word for interfacing keyboard. **(02 Marks)**

c. Write on assembly level program to interface logic controller for multiplication of two 8-bit numbers. **(10 Marks)**

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06CS46

Fourth Semester B.E. Degree Examination, December 2011
Computer Organization

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With a neat diagram, explain the different processor registers. **(08 Marks)**

b. Derive the basic performance equation. Discuss the measures to improve the performance. **(08 Marks)**

c. Convert the following pairs of decimal numbers to 5 bit signed 2's complement no and add them. State whether or not overflow occurs. i) 8 and 14 ii) – 10 and –5. **(04 Marks)**

2 a. Explain BIG – ENDIAN and LITTKE – ENDIAN methods of byte addressing, with proper examples. **(06 Marks)**

b. What is an addressing mode? Explain the different addressing modes, with an example for each. **(10 Marks)**

c. Explain the memory mapped I/O and program controlled I/O. **(04 Marks)**

3 a. Explain with a specific example, how a stack frame is built and dismantled for a particular invocation of a subroutine. **(08 Marks)**

b. Draw and explain the general 8 bit parallel interface. **(08 Marks)**

c. Define exceptions. Explain two kinds of exceptions. **(04 Marks)**

4 a. What is the necessity of a DMA controller? Showing the possible register configurations in DMA interface, explain the direct memory access. **(08 Marks)**

b. Explain the following , with respect to USB :
i) USB architecture ii) USB addressing iii) USB protocols. **(09 Marks)**

c. Explain the centralized and distributed BUS arbitrations, briefly. **(03 Marks)**

PART – B

5 a. With a neat block diagram, explain the organizations of 1KX1 memory chip. **(06 Marks)**

b. Define : i) Memory latency ii) Memory bandwidth
iii) Hit – rate iv) Miss – penalty. **(04 Marks)**

c. Explain the different mapping functions, used in cache memory. **(10 Marks)**

6 a. Write a note on flash memory. **(04 Marks)**

b. With a block diagram, explain the virtual memory organization. **(06 Marks)**

c. In a carry look ahead addition, explain the generate G_i and propagate P_i functions for stagei. Using this design 4 bit carry look ahead adder. **(10 Marks)**

7 a. Perform the signed multiplication of numbers +13 and – 6 using the booth multiplication algorithm. Represent the numbers in 5 bits including sign bit. Give the booth multipliers recoding table that is used in the above multiplication. **(08 Marks)**

b. Perform division of number 8 by 3 (8 ÷ 3) using the restoring division algorithm. **(08 Marks)**

c. Explain the different arithmetic operations on floating point numbers. **(04 Marks)**

8 a. Write and explain the control sequences for the execution of following instruction :
Add (R3), R1. **(06 Marks)**

b. With a neat diagram, explain a three bus organization. Write control sequence for the instruction Add R1, R2. R3. **(08 Marks)**

c. With a block diagram, explain a compete processor. **(06 Marks)**

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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.

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MATDIP401

Fourth Semester B.E. Degree Examination, December 2011
Advanced Mathematics – II

Time: 3 hrs. Max. Marks:100

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

1 a. If (ℓ, m, n) be the direction cosines of a line then prove that $\ell^2 + m^2 + n^2 = 1$. **(06 Marks)**

b. Find the angle between the two lines whose direction cosines satisfy the equations $\ell + m + n = 0$ and $2\ell + 2m - nm = 0$. **(07 Marks)**

c. Show that the angle between any two diagonals of a cube is $\cos^{-1}(1/3)$. **(07 Marks)**

2 a. Find the equation of the plane through the points $(1, -2, 2)$, $(-3, 1, -2)$ and perpendicular to the plane $2x - y - z + 6 = 0$. **(06 Marks)**

b. Find the image of the point $(1, 1, 2)$ in the plane $2x + y + z - 3 = 0$. **(07 Marks)**

c. Find the shortest distance and equation between the lines $\frac{x-1}{2} = \frac{y-2}{3} = \frac{z-3}{4}$ and the x – axis. **(07 Marks)**

3 a. Find the value of λ so that the vectors $\vec{a} = 2i - 3j + k$, $\vec{b} = i + 2j - 3k$ and $\vec{c} = j + \lambda k$ are coplanar. **(06 Marks)**

b. Find $\vec{a} \cdot (\vec{b} \times \vec{c})$ and $\vec{b} \cdot (\vec{a} \times \vec{c})$, where $\vec{a} = i + j - k$, $\vec{b} = 2i - j + 2k$ and $c = 3i - j - k$. **(07 Marks)**

c. Show that the position vectors of the vertices of a triangle $2i - j + k$, $i - 3j - 5k$ and $3i - 4j - 4k$ form a right angled triangle. **(07 Marks)**

4 a. Find the unit tangent vector to the space curve $x = \cos t^2$, $y = \sin t^2$ and $z = 0$. **(06 Marks)**

b. A particle moves along a curve with parametric equations $x = t - \frac{t^3}{3}$, $y = t^2$ and $z = t + \frac{t^3}{3}$, where t is the time. Find the velocity and acceleration at any time t and also find their magnitudes at $t = 3$. **(07 Marks)**

c. Find the angle between the surfaces $x^2yz + 3xz^2 = 5$ and $x^2yz^3 = 2$ at $(1, -2, -1)$. **(07 Marks)**

5 a. Find the directional derivative of x^2yz^3 at $(1, 1, 1)$ in the direction of $i + j + 2k$. **(06 Marks)**

b. Find the constants a, b, c such that the vector $\vec{F} = (\sin y + a z)\, i + (b x \cos y + z)\, j + (x + c y)\, k$ is irrotational. **(07 Marks)**

c. Prove that $\text{dir}(\text{curl } \vec{A}) = 0$. **(07 Marks)**

6 a. Find the Laplace transform of t^n, where n is a +ve integer. **(06 Marks)**

b. Find $L[t\, e^{-2t} \cos 2t]$. **(07 Marks)**

c. Find $L\left[\frac{e^{-at} - e^{-bt}}{t}\right]$. **(07 Marks)**

7 Find the inverse Laplace transform for the following :

a. $\frac{s+2}{s^2+8s+25}$

b. $\frac{2s-1}{s^2-5s+6}$

c. $\frac{s}{(s^2+a^2)^2}$.

d. $\log\left(\frac{s+a}{s+b}\right)$.

(20 Marks)

8 a. Solve using Laplace transforms

$\frac{d^2y}{dt^2}-3\frac{dy}{dt}+2y=e^{3t}$, given that $y(0)=0$ and $y'(0)=0$. **(10 Marks)**

b. Solve the simultaneous equations using Laplace transforms $\frac{dx}{dt}+y=\sin t$ and $\frac{dy}{dt}+x=\cos t$ subject to the conditions $x(0)=2$ and $y(0)=0$. **(10 Marks)**

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