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10MAT41

Fourth Semester B.E. Degree Examination, June/July 2017
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. Find $y(0.1)$ by using Taylor's series method, given that $y' = \sqrt{x^2 + y}$, $y(0) = 0.8$. Consider upto third order derivative terms. (06 Marks)
- b. Given : $\frac{dy}{dx} = \frac{1}{1+x^2} - 2y^2$, $y(0) = 0$. Find $y(0.5)$, by taking $h = 0.25$, using Euler's modified method. (07 Marks)
- c. If $y' = \frac{1}{x+y}$, $y(0) = 2.0000$, $y(0.2) = 2.0933$, $y(0.4) = 2.1755$, $y(0.6) = 2.2493$, find $y(0.8)$ by using Adams-Bash forth method. (07 Marks)
- 2 a. Using the Picard's method, obtain the 2nd order approximate solution of the problem at $x = 0.2$, $\frac{dy}{dx} = x + yz$; $\frac{dz}{dx} = y + zx$, $y(0) = 1$ and $z(0) = -1$. (06 Marks)
- b. Using the R-K method, find the solution at $x = 0.1$ of an equation; $y'' - x^2y' - 2xy - 1 = 0$ with the conditions $y(0) = 1$, $y'(0) = 0$ and step size 0.1. (07 Marks)
- c. Given that $y'' + xy = 0$, $y(0) = 1$, $y(0.1) = 1.0998$, $y(0.2) = 1.1987$, $y(0.3) = 1.2955$, $y'(0) = 1$, $y'(0.1) = 0.9946$, $y'(0.2) = 0.9773$, $y'(0.3) = 0.946$, find $y(0.4)$, using Milne's method. (Apply corrector formula only once). (07 Marks)
- 3 a. Derive Cauchy-Riemann equations in the polar form. (06 Marks)
- b. If $f(z) = u + iv$ is an analytic function, then prove that the family of curves; $u(x, y) = C_1$, $v(x, y) = C_2$, C_1 and C_2 being constants, intersect orthogonally. Is the converse true? Justify your answer. (07 Marks)
- c. In a two dimensional fluid flow; if the velocity potential is $e^{-x} \cos y + xy$, find the stream function. (07 Marks)
- 4 a. Find the bilinear transformation which maps the points $z = 1, i, -1$ onto the points $w = i, 0, -i$. Also find the invariant points. (06 Marks)
- b. Discuss the transformation, $w = z + \frac{K^2}{z}$, where $z \neq 0$, $K \neq 0$. (07 Marks)
- c. State and prove the Cauchy's theorem. (07 Marks)

PART – B

- 5 a. Obtain the series solution of Bessel's differential equation. (07 Marks)
- b. Derive the Rodrigue's formula. (07 Marks)
- c. Express the polynomial $2x^3 - x^2 - 3x + 2$ in terms of Legendre polynomials. (06 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. 'A' can hit a target 3 times in 5 shots, 'B' 2 times in 5 shots and 'C' 3 times in 4 shots. They fire a volley. Find the probability that (i) 2 shots hit (ii) at least 2 shots hit. (06 Marks)
- b. If A and B are events with $P(A) = \frac{1}{2}$, $P(A \cup B) = \frac{3}{4}$, $P(\bar{B}) = \frac{5}{8}$ find $P(A \cap B)$, $P(\bar{A} \cap \bar{B})$, $P(\bar{A} \cup \bar{B})$ and $P(\bar{A} \cap B)$. (07 Marks)
- c. State and prove Baye's theorem. (07 Marks)
- 7 a. (i) Is the function defined as follows a density function? $f(x) = e^{-x}$, $x \geq 0$, $f(x) = 0$, $x < 0$.
(ii) If so, determine the probability that the variate having this density will fall in the interval (1, 2).
(iii) Also find the cumulative probability function F(2). (06 Marks)
- b. Obtain the mean and standard deviation of the Poisson distribution. (07 Marks)
- c. The life of an electric bulb is normally distributed with mean life of 200 hours and S.D. of 60 hours. Out of 2500 bulbs, find the number of bulbs which are likely to last between 1900 and 2100 hours. Given that $P(0 < Z < 1.67) = 0.4525$. (07 Marks)
- 8 a. Explain the following terms briefly: (i) Null hypothesis (ii) Type I and Type II errors (iii) Confidence limits. (06 Marks)
- b. Two types of batteries are tested for their length of life and the following results are obtained:
Battery A : $n_1 = 10$, $\bar{x}_1 = 500$ hrs, $\sigma_1^2 = 100$
Battery B : $n_2 = 10$, $\bar{x}_2 = 560$ hrs, $\sigma_2^2 = 121$.
Find students 't' and test whether there is a significant difference in the two means. ($t_{0.05} = 2.10$ and $t_{0.01} = 2.88$). (07 Marks)
- c. Genetic theory states that children having one parent of blood type M and the other of blood type N will always be one of the three types M, MN, N and that the proportions of these types will on an average be 1 : 2 : 1. A report states that out of 300 children having one M parent and one N parent, 30% are found to be of type M, 45% of type MN and the remainder of type N. Test the theory by χ^2 (chi-square) test. (07 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2017

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. Given a graph G , shown in Fig.Q1(a) determine:

- i) Number of paths from a to h
 ii) Number of paths from a to h with path length 5.

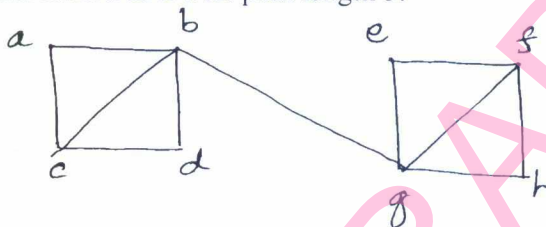


Fig.Q1(a)

(06 Marks)

- b. Prove that the maximum number of edges in a simple graph with n vertices is $n(n-1)/2$.

(06 Marks)

- c. Define isomorphism of graphs. Determine whether the following graphs are isomorphic.

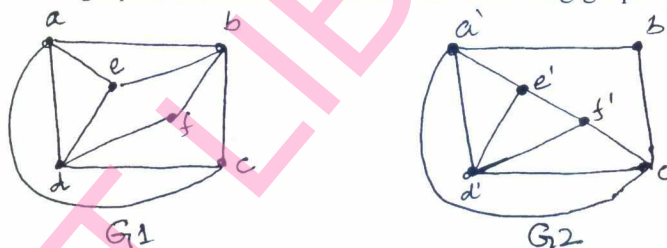


Fig.Q1(c)

(06 Marks)

- d. Draw a 3-regular graph which has 10 vertices and 15 edges.

(02 Marks)

- 2 a. State and prove the Euler's theorem for a connected planar graph G with n vertices, m edges and number of regions r .

(06 Marks)

- b. Show that in a complete graph with n vertices where n is an odd number and $n \geq 3$ there are $(n-1)/2$ edge Hamilton cycles.

(06 Marks)

- c. Define chromatic number of a graph. Determine the chromatic polynomial for the graph G shown in Fig.Q2(c).

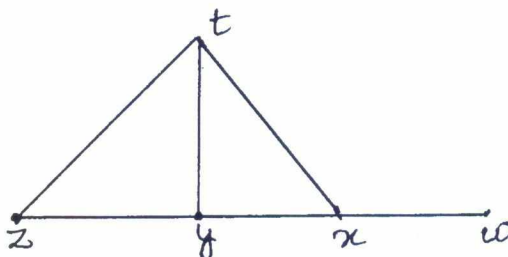


Fig.Q2(c)

(08 Marks)

- 3 a. Answer the following questions for the tree shown in Fig.Q3(a).
 i) Which vertices are the descendants of C?
 ii) Which vertices are the siblings of S?
 iii) Which vertices have level number 4?

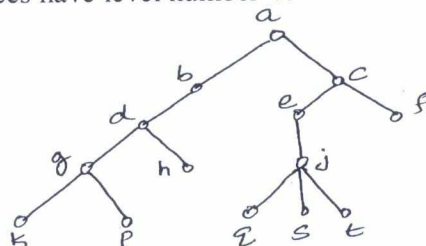


Fig.Q3(a)

(03 Marks)

- b. Define the following with respect to a rooted tree with root r $T = (V, E)$.
 i) Preorder traversal of T
 ii) Post-order traversal of T .

Given rooted tree shown in Fig.Q3(b). Find preorder traversal and post order traversal.

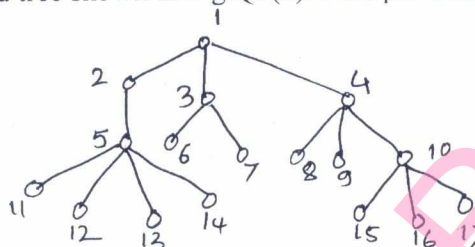


Fig.Q3(b)

(08 Marks)

- c. i) Prove that in every tree $T = (V, E)$, $|V| = |E| + 1$.
 ii) Let $F_1 = (V_1, E_1)$ be a forest of 7 trees, where $|E_1| = 40$. What is $|V_1|$?

(09 Marks)

- 4 a. Define by giving an example for each:
 i) Matching
 ii) Complete matching
 iii) Edge connectivity

(06 Marks)

- b. Explain the max-flow min-cut theorem. For the given weighted graph shown in the Fig.Q4(b) below, find all possible cut-sets from the vertices A and E, and hence find minimum and maximum capacity.

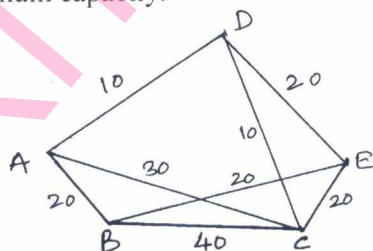


Fig.Q4(b)

(06 Marks)

- c. Give Kruskal's algorithm for an optimal spanning tree. Hence find a minimal spanning tree for the graph shown in Fig.Q4(c).

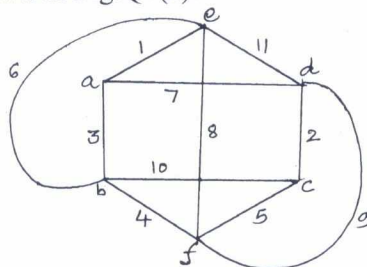


Fig.Q4(c)

(08 Marks)

PART – B

- 5 a. A minimeals include a soup, a course, a dessert and an ice-cream. Suppose that a customer can select from 5 soups, 6 course, 4 desserts and 3 types of ice-creams. How many different minimeals can be selected? (06 Marks)
- b. A certain question paper contains two parts A and B each having 4 questions. How many different ways a student can answer 5 questions by selecting atleast two questions from each part? (06 Marks)
- c. In how many possible ways could a student answer a 10 question TRUE/FALSE test? (02 Marks)
- d. Show that $b_{n+1} = \frac{2(2n+1)}{(n+2)} \times b_n$ where b_n is the n^{th} Catalan number. (06 Marks)
- 6 a. In how many ways can integers 1, 2, 3,,10 be arranged in a line so that no even integer is in its natural place? (10 Marks)
- b. A girl student has sarees of 5 different colors: blue, green, red, white and yellow. On Monday she does not wear green, on Tuesday blue or red, on Wednesday blue or green, on Thursday red or yellow and on Friday red. In how many ways can she dress without repeating a color during a week from Monday to Friday? (10 Marks)
- 7 a. In how many ways can 12 oranges can be distributed among 3 children A, B, and C so that A gets at least 4, B and C get at least 2 but C gets not more than five? (10 Marks)
- b. Determine the coefficient of x^8 in $\frac{1}{(x-3)(x-2)^2}$. (10 Marks)
- 8 a. Find and solve a recurrence relation for the number of binary sequences of length $n \geq 1$ that have no consecutive 0's. (10 Marks)
- b. The number of virus affected files in a system is 1000 (to start with) and this increases 250% in every two hours. Use a recurrence relation to determine the number of virus affected files in the system after one day. (10 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2017
Design and Analysis of Algorithms

Time: 3 hrs.

Max. Marks:100

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

PART – A

1 a. Algorithm X (int N)

```

{
  int P = N ;
  for i ← 1 to N
  {
    print (“\n % d\t =\t % d = % d”, N, i, P) ;
    P = P + N ;
  }
}

```

- i) What does this algorithm compute?
- ii) What is the basic operation?
- iii) How many times the basic operation is executed?
- iv) What is the efficiency class of this algorithm?

(04 Marks)

b. Define the following and give one example for each :

- i) O – notation ii) Ω – notation iii) θ – notation.

(06 Marks)

c. Explain Brute Force method. Write a algorithm for selection sort method and apply it to the following list :

66, 11, 35, 55, 44, 22. Compute time efficiency for average case.

(10 Marks)

2 a. Explain Divide and conquer technique. (04 Marks)

b. What is stable algorithm? Is quick sort stable? Explain with example. (06 Marks)

c. Explain with example a sorting algorithm that uses divide and conquer technique which divides the problem size by considering position. Give the corresponding algorithm and analyze the worst case time complexity. (10 Marks)

3 a. Explain Greedy Method. What is knapsack problem? Write the algorithm to obtain optimal solution for the knapsack problem using Greedy method, Apply the algorithm for $n = 3$, capacity $m = 20$, values: 25, 24, 15 and weights: 18, 15, 10 respectively. (10 Marks)

b. What is job sequencing with deadlines problem? Find the solution generated by job sequencing with deadlines problem for 7 jobs given profits: 3, 5, 20, 18, 1, 6, 30 and deadlines: 1, 3, 4, 3, 2, 1, 2 respectively. (06 Marks)

c. Write an algorithm to find the minimum cost spanning tree using Kruskal's method. Find minimum cost spanning tree using Kruskal's method for the graph shown in Fig. Q3(c).

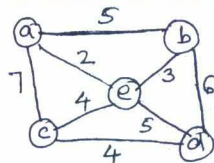


Fig. Q3(c)

(04 Marks)

- 4 a. Explain Dynamic programming. Generate transitive closure of the graph given in Fig. Q4 (a). (04 Marks)
 b. Write Floyd's algorithm. Using Floyd's algorithm, find all pair shortest path for the graph given in Fig. Q4(b). (10 Marks)
 c. Solve TSP for the graph shown in Fig. Q4(c). Using dynamic programming. (06 Marks)

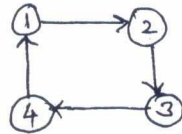


Fig. Q4(a)

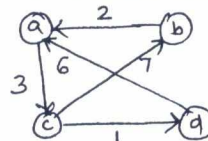


Fig. Q4(b)

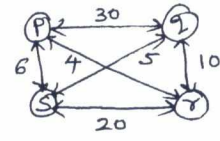


Fig. Q4(c)

PART - B

- 5 a. What are the three variations of decrease and conquer technique? (03 Marks)
 b. Apply DFS based algorithm to solve the topological sorting problem for the graph given in Fig. Q5 (b). (06 Marks)

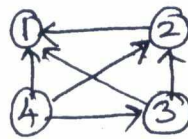


Fig. Q5(b)

- c. Write BFS algorithm to check the connectivity of a given graph. (05 Marks)
 d. Construct shift table for the Pattern : EARN and search for the same in text : FALL-MEANS-FIRST-ATTEMPT-IN-LEARNING using Horspool's algorithm. (06 Marks)

- 6 a. Define the following : i) Tractable problem ii) Class P iii) Class NP
 iv) Polynomial reduction v) NP complete problems. (05 Marks)
 b. What are decision trees? Explain with example, how decision trees are used in selection sort algorithm. (10 Marks)
 c. What is numeric analysis? Brief overflow and underflow in numeric analysis algorithm. (05 Marks)

- 7 a. What is backtracking method? Apply backtracking method to solve subset sum problem for the instance $n = 6, d = 30$ and $s = \{5, 10, 12, 13, 15, 18\}$. (06 Marks)
 b. What is branch and bound method? For the given $n \times n$ cost matrix C for a job assignment problem, find the optimal solution using branch and bound method. Give complete state space tree for the assignment problem.

	Job 1	Job 2	Job 3	Job 4	
$C =$	9	2	7	8	Person a
	6	4	3	7	Person b
	5	8	1	8	Person c
	7	6	9	4	Person d

(10 Marks)

- c. Explain approximation algorithm for NP hard problems in general. Discuss approximation algorithm for knapsack problem. (04 Marks)
- 8 a. Explain how matrix M is computed using parallel algorithm for a given graph. (03 Marks)
 b. What is prefix computation problem? Give the algorithm for prefix computation which uses:
 i) n processors ii) $\frac{n}{\log n}$ processors. Obtain the time complexities of these algorithms. (10 Marks)
 c. What is super linear speed up? Obtain the maximum speed up when $P = 10$, and various values of $f = 0.5, 0.1, 0.01$. What are the different ways of resolving read and write conflicts? (07 Marks)

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10CS44

Fourth Semester B.E. Degree Examination, June/July 2017
Unix and Shell Programming

Time: 3 hrs.

Max. Marks:100

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

PART - A

- 1
 - a. With a neat diagram, explain the relationship between Kernel and Shell of the UNIX Operating System. (08 Marks)
 - b. Give the directory structure of UNIX file system, with brief explanation. (06 Marks)
 - c. Explain the following commands with example :
 i) cmp ii) comm iii) diff. (06 Marks)

- 2
 - a. Explain different modes in vi editor And list commands in each mode. (08 Marks)
 - b. Explain briefly the file attributes listed using ls - l command. (06 Marks)
 - c. What are standard input, standard output and standard error? Explain with respect to UNIX operating system. (06 Marks)

- 3
 - a. Explain the following environmental variables : (08 Marks)
 i) HOME ii) PS2 iii) PATH iv) IFS.
 - b. Explain the mechanism of process creation and role of system calls. (06 Marks)
 - c. Frame Shell wild card pattern :
 i) List all files whose first character is anything other than an alphabet not in the range d to m.
 ii) List all files whose first character is anything other than an alphabet.
 iii) List all 4 character filenames whose first character is 'a' and third character is 'b'. (06 Marks)

- 4
 - a. Explain the following commands with examples :
 i) head ii) cut iii) sort iv) tr. (08 Marks)
 - b. What is File Permissions? What are the different ways of setting file permissions? Explain. (06 Marks)
 - c. Differentiate between hard links and symbolic links with example. (06 Marks)

PART - B

- 5
 - a. How does grep help in searching for a pattern? Explain its i, c, v, n and l options. (08 Marks)
 - b. What are Extended Regular Expression (ERE) set used by grep? (06 Marks)
 - c. Write any six internal commands used by Sed. (06 Marks)

- 6
 - a. What is Shell Programming? Write a shell program that will do the following tasks in order
 i) Clear the screen ii) Print the current directory iii) Display the current login users. (08 Marks)
 - b. What are Positional Parameters used by Shell? Explain briefly. (06 Marks)
 - c. Explain Shell features of while and for with syntax. (06 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.

- 7 a. Write an awk script to find HRA, DA and netpay of an employee where DA is 50% of basic, HRA is 10% of basic and the net pay is the sum of HRA , DA and basic pay. (08 Marks)
- b. What are built in variables used by awk? (06 Marks)
- c. Explain any six built in function in awk. (06 Marks)
- 8 a. Explain the variables and operators in Perl. (06 Marks)
- b. Explain String handling functions in Perl. (06 Marks)
- c. Write a Perl script to convert a decimal to binary. (08 Marks)

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Fourth Semester B.E. Degree Examination, June/July 2017
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 program visible internal register – organization of 8086 microprocessor. (05 Marks)
- b. What is real mode addressing? Explain default segment and offset registers. (05 Marks)
- c. Write any five differences between real mode and protected mode memory system. (05 Marks)
- d. What is pipelining? How is it achieved in 8086? (05 Marks)
- 2 a. Explain with example the various data related addressing modes of 8086. (08 Marks)
- b. Explain the various descriptors used in 80286 – core 2 processors operating in protected mode. (06 Marks)
- c. Generate the machine code for the following 8086 instruction: (06 Marks)
 - (i) MOV AX, BX
 - (ii) MOV CL, [SI]
- 3 a. Write an assembly language program to add 10 non-negative 8 bit numbers. (08 Marks)
- b. Explain the following instructions with examples: (06 Marks)
 - (i) XCHG (ii) LEA (iii) LAHF (iv) CMP (v) LODSB (vi) STOSB
- c. What do you mean by assembler directives? Explain the following directives : (i) ORG (ii) PROC and ENDP (iii) OFFSET. (06 Marks)
- 4 a. Explain the various string manipulation instructions with example. (10 Marks)
- b. Differentiate between short, near and far jump instructions with two examples of each. (10 Marks)

PART – B

- 5 a. Differentiate between macros and procedures. (06 Marks)
- b. Define modular programming. Explain with suitable example. (07 Marks)
- c. Distinguish between the 16 bit and 32 bit versions of C/C++ when using the assembler. (07 Marks)
- 6 a. Bring out the differences between 8086 and 8088 microprocessor. (06 Marks)
- b. With neat timing diagram, explain 8086 memory read cycle. (07 Marks)
- c. With neat diagram, explain the minimum mode system of 8086 microprocessor. (07 Marks)
- 7 a. Mention the differences between memory mapped I/O and isolated I/O. (06 Marks)
- b. How 8086 microprocessor selects 8 bit on 16 bit data from odd or even memory banks? (06 Marks)
- c. With neat diagram, explain simple NAND gate address decoding logic to select 2K × 8 EPROM for 8086 processor. (08 Marks)
- 8 a. Explain briefly the interrupt vector table of 8086 microprocessor. (10 Marks)
- b. Explain the pin-out of 8255 along with different operational modes. (10 Marks)

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10CS46

Fourth Semester B.E. Degree Examination, June/July 2017
Computer Organisation

Time: 3 hrs.

Max. Marks: 100

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

PART – A

- 1
 - a. Explain in brief different types of key parameters that affect the processor performance. (05 Marks)
 - b. Draw and explain the connection between memory and processor, with the respective register. (05 Marks)
 - c. List the different systems used to represent signed numbers. Perform the following operations on the 5 – bit signed numbers using 2's compliment representation system
 - i) $(-8) + (-12)$ ii) $(-6) - (+2)$ iii) $(-8) - (+3)$. (10 Marks)
- 2
 - a. What is Little endian and Big endian memory? Represent any 32 bits number in big endian and little endian memory. (05 Marks)
 - b. Write an assembly language program to convert unpacked BCD number to packed BCD number. (05 Marks)
 - c. With example, explain any four addressing modes. (05 Marks)
 - d. With example, explain Logical shift and Arithmetic shift instruction. (05 Marks)
- 3
 - a. What is IO mapped IO and memory mapped IO? Explain them in briefly. (05 Marks)
 - b. With figure, explain Distributed Arbitration in detail. (10 Marks)
 - c. What are the different methods of DMA? Explain them in brief. (05 Marks)
- 4
 - a. With a block diagram, explain how output device is interfaced to processor. (10 Marks)
 - b. Explain with Timing signal of read operation on PCI (Peripheral Component Interconnect) bus by showing role of IRDY/TRDY. (10 Marks)

PART – B

- 5
 - a. With figure, explain Internal structure of Static memory. (05 Marks)
 - b. With figure, explain Internal organization of $2M \times 8$ dynamic memory chip. (10 Marks)
 - c. Explain in detail the Associative mapping of cache memory. (05 Marks)
- 6
 - a. Design and explain 4 bit carry look ahead adder. (10 Marks)
 - b. Perform signed multiplication of numbers $(+13)$ and (-6) by using bit pair recoding technique. (05 Marks)
 - c. Explain with example IEEE standard for floating point numbers. (05 Marks)
- 7
 - a. List out the action needed to execute the instruction add $(R_3), R_1$. Write and explain sequence of control steps for the execution of the same. (10 Marks)
 - b. With figure, explain Control Unit Organization. (10 Marks)
- 8
 - a. Explain the classic organization of a shared memory multiprocessor. (10 Marks)
 - b. Explain the different approaches used in multithreading. (10 Marks)

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MATDIP401

Fourth Semester B.E. Degree Examination, June/July 2017
Advanced Mathematics – II

Time: 3 hrs.

Max. Marks:100

Note: Answer any FIVE full questions.

- 1 a. Find the angle between any two diagonals of a cube. (06 Marks)
 b. Find the angle between two lines whose direction cosines are given by $\ell + 3m + 5n = 0$ and $2mn - 6n\ell - 5\ell m = 0$. (07 Marks)
 c. Find the coordinates of the foot of the perpendicular from A(1, 1, 1) to the line joining the points B(1, 4, 6) and C(5, 4, 4). (07 Marks)
- 2 a. Find the equation of the plane through (2, -1, 6) and (1, -2, 4) and perpendicular to the plane $x - 2y - 2z + 9 = 0$. (06 Marks)
 b. Find the equation of a straight line through (7, 2, -3) and perpendicular to each of the lines $\frac{x-1}{3} = \frac{y-3}{4} = \frac{z-4}{5}$ and $\frac{x+2}{4} = \frac{y-3}{5} = \frac{z-4}{6}$. (07 Marks)
 c. Find the angle between the planes $x - y + z - 6 = 0$ and $2x + 3y + z + 5 = 0$. (07 Marks)
- 3 a. If \vec{a} , \vec{b} and \vec{c} are any three vectors then prove that $\vec{a} \times (\vec{b} \times \vec{c}) = (\vec{a} \cdot \vec{c})\vec{b} - (\vec{a} \cdot \vec{b})\vec{c}$ (06 Marks)
 b. If $\vec{A} = 4\vec{i} + 3\vec{j} + \vec{k}$, $\vec{B} = 2\vec{i} - \vec{j} + 2\vec{k}$ find a unit vector N perpendicular to the vectors \vec{A} and \vec{B} also show that \vec{A} is not perpendicular to \vec{B} . (07 Marks)
 c. Find the value of λ so that the points A(-1, 4, -3), B(3, 2, -5), C(-3, 8, -5) and D(-3, λ , 1) lie on the same plane. (07 Marks)
- 4 a. A particle moves along the curve $x = 2t^2$, $y = t^2 - 4t$, $z = 3t - 5$ where t is time. Find the components of its velocity and acceleration in the direction of the vector $\vec{i} - 3\vec{j} + 2\vec{k}$ at $t = 1$. (06 Marks)
 b. Find the angle between tangents to the curve $x = t^2 + 1$, $y = 4t - 3$, $z = 2t^2 - 6t$ at $t = 1$ and $t = 2$. (07 Marks)
 c. Find the directional derivative of $x^2yz + 4xz^2$ at (1, -2, -1) in the direction of $2\vec{i} - \vec{j} - 2\vec{k}$. (07 Marks)
- 5 a. Prove that $\text{div}(\text{curl } \vec{A}) = 0$. (06 Marks)
 b. Find the divergence and curl of the vector $\vec{F} = (xyz + y^2z)\vec{i} + (3x^2y + y^2z)\vec{j} + (xz^2 - y^2z)\vec{k}$ (07 Marks)
 c. Find the constants a, b, c so that the vector, $\vec{F} = (x + 2y + az)\vec{i} + (bx - 3y - z)\vec{j} + (4x + cy + 2z)\vec{k}$ is irrotational. (07 Marks)

- 6 Find :
- a. $L[\sin 5t \sin 3t]$ ~~(05 Marks)~~
(05 Marks)
 - b. $L[te^{8t} \cos 2t]$ (05 Marks)
 - c. $L\left[\frac{1-e^{at}}{t}\right]$ (05 Marks)
 - d. $L\left[\int_0^t e^{2t} \frac{\sin at}{t} dt\right]$ (05 Marks)
- 7 a. Find $L^{-1}\left[\frac{2s-1}{s^2+2s+17}\right]$. (05 Marks)
- b. Find $L^{-1}\left[\frac{s+1}{(s-1)^2(s+2)}\right]$. (05 Marks)
- c. Find $L^{-1}\left[\cot^{-1}\left(\frac{s}{a}\right)\right]$. (05 Marks)
- d. Using convolution theorem evaluate $L^{-1}\left[\frac{s}{(s+2)(s^2+9)}\right]$. (05 Marks)
- 8 a. Using Laplace transforms, solve $\frac{d^2y}{dt^2} + 2\frac{dy}{dt} - 3y = \sin t$ given $y(0) = y'(0) = 0$ ~~(10 Marks)~~
- b. Using Laplace transforms, solve $\frac{dx}{dt} + y = \sin t$, $\frac{dy}{dt} + x = \cos t$, given $x = 2$, $y = 0$ when $t = 0$. (10 Marks)
