IV 10 CS/IS

USN | | | | | | | | | |

10MAT41

Fourth Semester B.E. Degree Examination, June 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. Using the Taylor's method, find the third order approximate solution at x = 0.4 of the problem $\frac{dy}{dx} = x^2y + 1$, with y(0) = 0. Consider terms upto fourth degree. **(06 Marks)**

b. Solve the differential equation $\frac{dy}{dx} = -xy^2$ under the initial condition y(0) = 2, by using the modified Euler's method, at the points x = 0.1 and x = 0.2. Take the step size h = 0.1 and carry out two modifications at each step. **(07 Marks)**

c. Given $\frac{dy}{dx} = xy + y^2$; y(0) = 1, y(0.1) = 1.1169, y(0.2) = 1.2773, y(0.3) = 1.5049, find y(0.4) correct to three decimal places, using the Milne's predictor-corrector method. Apply the corrector formula twice. **(07 Marks)**

2 a. Employing the Picard's method, obtain the second order approximate solution of the following problem at x = 0.2.

$$\frac{dy}{dx} = x + yz; \quad \frac{dz}{dx} = y + zx; \quad y(0) = 1, \quad z(0) = -1.$$ **(06 Marks)**

b. Using the Runge-Kutta method, solve the following differential equation at x = 0.1 under the given condition:

$$\frac{d^2y}{dx^2} = x^3\left(y + \frac{dy}{dx}\right), \quad y(0) = 1, \quad y'(0) = 0.5.$$

Take step length h = 0.1. **(07 Marks)**

c. Using the Milne's method, obtain an approximate solution at the point x = 0.4 of the problem $\frac{d^2y}{dx^2} + 3x\frac{dy}{dx} - 6y = 0$, y(0) = 1, y′(0) = 0.1. Given y(0.1) = 1.03995, y′(0.1) = 0.6955, y(0.2) = 1.138036, y′(0.2) = 1.258, y(0.3) = 1.29865, y′(0.3) = 1.873. **(07 Marks)**

3 a. Derive Cauchy-Riemann equations in polar form. **(06 Marks)**

b. If f(z) is a regular function of z, prove that $\left(\frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}\right)|f(z)|^2 = 4|f'(z)|^2$. **(07 Marks)**

c. If w = ϕ + iy represents the complex potential for an electric field and $y = x^2 - y^2 + \frac{x}{x^2 + y^2}$ determine the function ϕ. Also find the complex potential as a function of z. **(07 Marks)**

4 a. Discuss the transformation of $w = z + \frac{k^2}{z}$. **(06 Marks)**

b. Find the bilinear transformation that transforms the points $z_1 = i$, $z_2 = 1$, $z_3 = -1$ on to the points $w_1 = 1$, $w_2 = 0$, $w_3 = \infty$ respectively. **(07 Marks)**

c. Evaluate $\int_C \frac{\sin \pi z^2 + \cos \pi z^2}{(z-1)^2(z-2)} dz$ where c is the circle $|z| = 3$, using Cauchy's integral formula. **(07 Marks)**

PART – B

5 a. Obtain the solution of $x^2y'' + xy' + (x^2 - n^2)y = 0$ in terms of $J_n(x)$ and $J_{-n}(x)$. **(06 Marks)**

b. Express $f(x) = x^4 + 3x^3 - x^2 + 5x - 2$ in terms of Legendre polynomials. **(07 Marks)**

c. Prove that $\int_{-1}^{+1} P_m(x) \cdot P_n(x) dx = \frac{2}{2n+1}$, $m = n$. **(07 Marks)**

6 a. From five positive and seven negative numbers, five numbers are chosen at random and multiplied. What is the probability that the product is a (i) negative number and (ii) positive number? **(06 Marks)**

b. If A and B are two events with $P(A) = \frac{1}{2}$, $P(B) = \frac{1}{3}$, $P(A \cap B) = \frac{1}{4}$, find P(A/B), P(B/A), $P(\overline{A}/\overline{B})$, $P(\overline{B}/\overline{A})$ and $P(A/\overline{B})$. **(07 Marks)**

c. In a certain college, 4% of boy students and 1% of girl students are taller than 1.8 m. Furthermore, 60% of the students are girls. If a student is selected at random and is found taller than 1.8 m, what is the probability that the student is a girl? **(07 Marks)**

7 a. A random variable x has the density function $P(x) = \begin{cases} Kx^2, & 0 \le x \le 3 \\ 0, & \text{elsewhere} \end{cases}$. Evaluate K, and find: i) $P(x \le 1)$, (ii) $P(1 \le x \le 2)$, (iii) $P(x \le 2)$, iv) $P(x > 1)$, (v) $P(x > 2)$. **(06 Marks)**

b. Obtain the mean and standard deviation of binomial distribution. **(07 Marks)**

c. In an examination 7% of students score less than 35% marks and 89% of students score less than 60% marks. Find the mean and standard deviation if the marks are normally distributed. It is given that $P(0 < z < 1.2263) = 0.39$ and $P(0 < z < 1.4757) = 0.43$. **(07 Marks)**

8 a. A random sample of 400 items chosen from an infinite population is found to have a mean of 82 and a standard deviation of 18. Find the 95% confidence limits for the mean of the population from which the sample is drawn. **(06 Marks)**

b. In the past, a machine has produced washers having a thickness of 0.50 mm. To determine whether the machine is in proper working order, a sample of 10 washers is chosen for which the mean thickness is found as 0.53 mm with standard deviation 0.03 mm. Test the hypothesis that the machine is in proper working order, using a level of significance of (i) 0.05 and (ii) 0.01. **(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% were 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)**

* * * * *

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.

USN [| | | | | | | | |]

Fourth Semester B.E. Degree Examination, June 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. Define and give an example for each of the following:
i) Connected graph ii) Spanning subgraph iii) Complement of a graph. **(06 Marks)**
b. Define isomorphism. Show that the following graphs are isomorphic. **(07 Marks)**

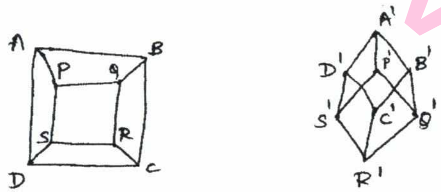

Fig.Q1 (b)

c. In the graph given below find the number of paths from v_1 to v_8. How many of these paths have length 5. **(07 Marks)**

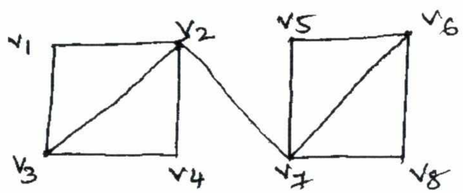

Fig.Q1(c)

2 a. Define Hamilton cycle. How many edge-disjoint Hamilton cycles exist in the complete graph with seven verticies? Also draw the graph to show these Hamilton cycles. **(07 Marks)**
b. Prove that Peterson graph is non-planar. **(06 Marks)**
c. Define chromatic number of a graph. Find the chromatic polynomial for the graph shown below and also find the chromatic number for the same. **(07 Marks)**

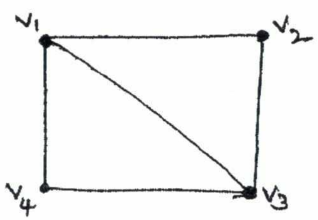

Fig.Q2(c)

3 a. Define and give an example for each of the following:
i) Rooted tree ii) Complete binary tree iii) Balanced tree. **(06 Marks)**
b. Construct an optimal prefix code for the symbols a, o, q, u, y, z that occur with the frequencies 20, 28, 4, 17, 12, 7 respectively. **(07 Marks)**
c. Obtain the optimal prefix code for the message "ROAD IS GOOD". Indicate the code. **(07 Marks)**

4 a. For the network shown below, determine the maximum flow between the vertices A and D by identifying the cutset of minimum capacity. **(07 Marks)**

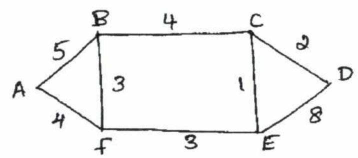

Fig.Q4(a)

b. State and prove max-flow and min-cut theorem. **(06 Marks)**
c. Apply prims algorithm to determine a minimal spanning tree for the weighted graph shown below. **(07 Marks)**

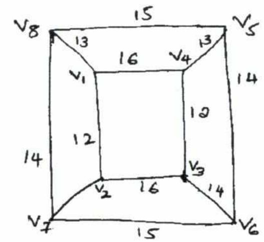

Fig.Q4 (c)

PART – B

5 a. State and explain product rule of counting along with an example. **(04 Marks)**
b. Find the co-efficient of :
i) $x^9 y^3$ in the expansion of $(2x-3y)^{12}$
ii) x^{0} in the expansion of $\left(3x^2 - \frac{2}{x}\right)^{15}$. **(08 Marks)**
c. i) From seven consonants and five vowels how many sets consisting of four different consonants and three different vowels can be formed.
ii) Find the number of arrangement of the letters in TALLAHASSEE which have no adjacent A's. **(08 Marks)**

6 a. Out of 30 students in a hostel, 15 study history, 8 study economics, and 6 study geography. It is known that 3 students study all these subjects. Show that 7 or more students study none of these subjects. **(06 Marks)**
b. Find the number of derangements of the integers from 1 to 2n satisfying the condition that the elements in the first n-places are:
i) 1, 2, 3........ n in some order ii) n +1, n +2...... 2n in some order. **(06 Marks)**
c. What is the expansion formula for rook-polynomials? Find the rook polynomial for the 3 ×3 board by using the expansion formula. **(08 Marks)**

USN | | | | | | | | | | | **10CS43**

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

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. If $t_1(n) \in 0(g_1(n))$ and $t_2(n) \in 0(g_2(n))$, prove that
$t_1(n) + t_2(n) \in 0(\max\{g_1(n), g_2(n)\})$. **(06 Marks)**

b. If M(n) denotes the number of moves in tower of Hanoi puzzle when n disks are involved, give a recurrence relation for M(n) and solve this recurrence relation. **(07 Marks)**

c. Give an algorithm for selection sort. If C(n) denotes the number of times the algorithm is executed (n denotes input size), obtain an expression for C(n). **(07 Marks)**

2 a. Assuming that n is a power of 2, solve the recurrence relation $T(n) = 2T(n/2) + 2$. Take $T(2) = 1$ and $T(1) = 0$. **(05 Marks)**

b. If $n \in [2^{k-1}, 2^k)$, prove that binary search algorithm makes at most K element comparisons for a successful search and either K – 1 or K comparisons for an unsuccessful search. **(06 Marks)**

c. Give an algorithm for merge sort. **(05 Marks)**

d. Consider the numbers given below. Show how partitioning algorithm of quick sort will place 106 in its correct position. Show all the steps clearly.
106 117 128 134 141 91 84 63 42. **(04 Marks)**

3 a. Let J be a set of K jobs and $\sigma = i_1, i_2, i_3, \ldots\ldots, i_k$ be a permutation of jobs in J such that $di_1 \le di_2 \le \ldots\ldots \le di_k$. Prove that J is a feasible solution if and only if the jobs in J can be processed in the order σ without violating any deadline. **(07 Marks)**

b. Using Prim's algorithm, determine minimum cost spanning tree for the weighted graph shown below, fig.Q.3(b): **(07 Marks)**

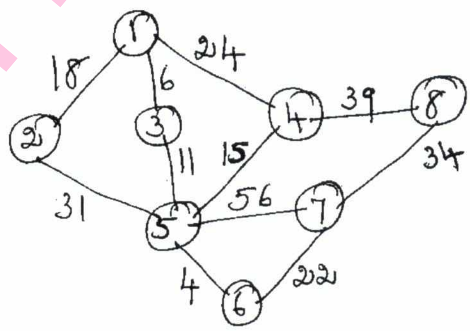

Fig.Q.3(b)

c. In the weighted digraph given below, fig.Q.3(c) determine the shortest paths from vertex 1 to all other vertices. **(06 Marks)**

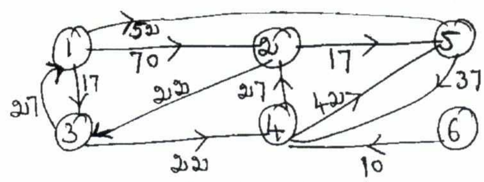

Fig.Q.3(c)

4 a. Obtain the shortest paths from every vertex to every other vertex in the diagraph given below; fig.Q.4(a) **(10 Marks)**

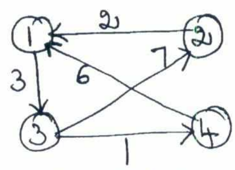

Fig.Q.4(a)

b. Using Warshall's algorithm, obtain the transitive closure of the matrix given below:

$$R = \begin{pmatrix} 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 1 & 0 \end{pmatrix}.$$ **(10 Marks)**

PART – B

5 a. Show how insertion sort algorithm arranges the following members in increasing order.
61 28 9 85 34. **(06 Marks)**

b. Obtain topological sorting for the diagraph given below: **(06 Marks)**

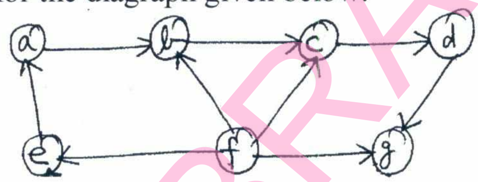

Fig.Q.5(b)

c. Give algorithms for the following:
i) Comparison counting; ii) Distribution counting. **(08 Marks)**

6 a. Define the following: i) Tractable problems; ii) Class P; iii) Class NP; iv) Polynomial reduction; v) NP complete problems. **(05 Marks)**

b. State subset sum problem. Using back tracking, obtain a solution to the subset sum problem by taking s = {6, 8, 2, 14} and d = 16. **(07 Marks)**

c. Explain approximation algorithms for NP – hard problems in general. Also discuss approximation algorithms for knapsack problem. **(08 Marks)**

7 a. What is prefix computation problem? Give the algorithms for prefix computation which uses i) n processors; ii) $\frac{n}{\log n}$ processors. Obtain the time complexities of these algorithms. **(10 Marks)**

b. For an n × n matrix M with nonnegative integer coefficients, define $\widetilde{M}$ and give an algorithm for computing $\widetilde{M}$. Prove that $\widetilde{M}$ can be computed from an n × n matrix M in $0(\log n)$ time using $n^{3+\epsilon}$ common CRCW PRAM processors for any fixed $\epsilon > 0$. **(10 Marks)**

8 Write short notes on:
a. Traveling salesperson problem.
b. Input enhancement in string matching.
c. Decision trees.
d. Challenges of numerical algorithms. **(20 Marks)**

* * * * *

USN | | | | | | | | | | 10CS44

Fourth Semester B.E. Degree Examination, June 2012
Unix and Shell Programming

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. With neat diagram, explain the architecture of unix operating system. **(06 Marks)**

b. With the help of a diagram, explain the parent-child relationship. Explain the unix file system. **(06 Marks)**

c. Explain the following with examples:
i) Absolute and relative path names ii) Internal and external commands. **(08 Marks)**

2 a. A file's current permissions are rw _ r _ x r _ _ . Specify the chmod expression required to change them for the following:
i) rwx rwx rwx ii) r _ _ r _ _ _ _ _
iii) _ _ _ _ _ _ _ _ _ iv) _ _ _ r _ _ r _ _
using both the relative and absolute methods of assigning permissions. **(08 Marks)**

b. Explain briefly the file attributes listed using ls - l command. **(06 Marks)**

c. What are the different modes of Vi editor? Explain with a diagram. **(06 Marks)**

3 a. Explain the three standard files with respect to unix operating systems. **(06 Marks)**

b. Explain the mechanism of process creation. **(06 Marks)**

c. Explain the following commands with an example:
i) Running jobs in background ii) Execute later. **(08 Marks)**

4 a. Explain the following environment variables with examples:
i) SHELL ii) LOGNAME iii) PATH **(06 Marks)**

b. Differentiate between hard link and soft link in unix with examples. **(06 Marks)**

c. Explain the following commands with example:
i) tail ii) paste iii) tr iv) pr **(08 Marks)**

PART – B

5 a. With suitable examples, explain the grep command and its various options. **(08 Marks)**

b. Explain the line addressing and context addressing in sed with examples. **(06 Marks)**

c. Explain the different ways of using test statements, with examples. **(06 Marks)**

6 a. What is shell programming? Write a shell program that will do the following tasks in order:
Clear the screen
Print the current directory
Display current login users. **(08 Marks)**

b. Explain the shell features of 'while' and 'for' with syntax. **(08 Marks)**

c. What is the 'exit' status of a command and where is it stores? **(04 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. What is AWK? Explain any three built in functions in AWK. **(07 Marks)**

b. Write an AWK sequence to find HRA, DA and Netpay of an employee, where DA is 25% of basic, HRA is 50% basic and netpay is the sum of HRA, DA and basic pay. **(07 Marks)**

c. Explain the list and arrays in PERL. **(06 Marks)**

8 a. Explain the following storing handling functions of PERL with examples:
i) length ii) index iii) substr iv) reverse **(08 Marks)**

b. Write a PERL program to print numbers that are accepted from keyboard using while and array construct. **(06 Marks)**

c. Explain the following in PERL with examples.
i) fore each loping construct ii) join **(06 Marks)**

* * * * *

USN | | | | | | | | | | |

10CS45

Fourth Semester B.E. Degree Examination, June 2012
Microprocessors

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Describe the memory map of a PC system, with a neat diagram. **(08 Marks)**
b. Explain the flags of 8086 processor using suitable examples. **(06 Marks)**
c. Draw and explain the programming model of the 8086 through the CORE-2 microprocessor including the 64-bit extensions. **(06 Marks)**

2 a. What are the advantages of memory paging? Illustrate the concept of paging with a neat diagram. **(10 Marks)**
b. Discuss the following addressing modes with examples:
i) Direct
ii) Register indirect
iii) Base plus index
iv) Immediate
v) Scaled indexed. **(10 Marks)**

3 a. Describe the following instruction with suitable examples:
i) PUSH ii) MUL iii) IN iv) AAA. **(08 Marks)**
b. Write an ALP using 8086 instructions to generate and add the first 10 even numbers and save the numbers and result in memory location Num and Sum. **(08 Marks)**
c. Bring out the importance of XLAT instruction using a suitable program. **(04 Marks)**

4 a. Write an ALP using 8086 instructions to count the numbers of zeros in a given 8 bit number and store the result in memory location 'Res'. **(08 Marks)**
b. Explain the following assembler directives: i) Assume; ii) Proc; iii) Ends; iv) DB. **(08 Marks)**
c. Briefly explain any four bit test instructions. **(04 Marks)**

PART – B

5 a. Explain public and extrn directives of assembler and write ALP to read data through keyboard using external procedure and save the keycode in public data segment. **(08 Marks)**
b. Write a C program that uses '-asm' function to display strings on output device. **(06 Marks)**
c. Explain with neat diagram clock generator IC8284. **(06 Marks)**

6 a. Explain in brief the functions of 8086 pins: i) MN/$\overline{\text{MX}}$; ii) ALE; iii) NMI; iv) Ready; v) Reset; vi) $\overline{\text{BHE}}$. **(06 Marks)**
b. Describe demultiplexing of multiplexed AD bus with neat diagram. **(06 Marks)**
c. With neat timing diagram, explain memory read cycle. **(08 Marks)**

7 a. Interface 512 KB RAM to 8088 MP using 64 KB RAM using 3:8 decoder with starting address of memory as 80000H. Clearly mention decoding logic and memory map. **(08 Marks)**

b. Explain memory bank selection in 8086 and mention the number of memory bank in 80×86 MPs. **(06 Marks)**

c. Differentiate between memory mapped I/O and I/O mapped I/O (isolated I/O). **(06 Marks)**

8 a. Interface 8 digit seven segment LED display to 8088 MP through 8255 PPI. Write initialization sequence for 8255 with all port as output ports in mode 0 and address of device is FFOOh. **(08 Marks)**

b. Explain control work format for IC 8254 and interface IC to 8086 MP to generate square wave of 100 kHz using counter 0 write an ALP for the same. Assume clock frequency of 10 MHz. **(08 Marks)**

c. Explain interrupt vector table in brief. **(04 Marks)**

* * * * *

USN | | | | | | | | | | |

MATDIP401

Fourth Semester B.E. Degree Examination, June 2012
Advanced Mathematics - II

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 angles between any two diagonals of a cube. **(06 Marks)**

b. Find the equations of two planes, which bisect the angles between the planes $3x - 4y + 5z = 3$, $5x + 3y - 4z = 9$. **(07 Marks)**

c. Find the image of the point (1, 2, 3) in the line $\frac{x+1}{2} = \frac{y-3}{3} = -z$ **(07 Marks)**

2 a. Find the equation of the plane through the point (1, -1, 0) and perpendicular to the line $2x + 3y + 5z - 1 = 0 = 3x + y - z + 2$. **(06 Marks)**

b. Find the value of k such that the line $\frac{x}{k} = \frac{y-2}{2} = \frac{z+3}{3}$ and $\frac{x-2}{2} = \frac{y-6}{3} = \frac{z-3}{4}$ are coplanar. For this k find their point of intersection. **(07 Marks)**

c. Find the distance of the point (1, -2, 3) from the plane $x - y + z = 5$ measured parallel to the line $\frac{x}{2} = \frac{y}{3} = \frac{z}{-6}$. **(07 Marks)**

3 a. Show that the position vectors of the vertices of a triangle $\vec{a} = 3(\sqrt{3}\hat{i} - \hat{j})$, $\vec{b} = 6\hat{j}$, $\vec{c} = 3(\sqrt{3}\hat{i} + \hat{j})$ form an isosceles triangle. **(06 Marks)**

b. Find the unit normal to both the vectors $4\hat{i} - \hat{j} + 3\hat{k}$ and $-2\hat{i} + \hat{j} - 2\hat{k}$. Find also the sine of the angle between them. **(07 Marks)**

c. Prove that the position vectors of the points A, B, C and D represented by the vectors $-\hat{j} - \hat{k}$, $4\hat{i} + 5\hat{j} + \hat{k}$, $3\hat{i} + 9\hat{j} + 4\hat{k}$ and $-4\hat{i} + 4\hat{j} + 4\hat{k}$, respectively are coplanar. **(07 Marks)**

4 a. 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) may lie on one plane. **(06 Marks)**

b. If $\vec{a}, \vec{b}, \vec{c}$ are the position vectors of points A, B, C, prove that ($\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}$) is a vector perpendicular to the plane of triangle ABC. **(07 Marks)**

c. Find a set of vectors reciprocal to the set $2\hat{i} + 3\hat{j} - \hat{k}$, $\hat{i} - \hat{j} - 2\hat{k}$, $\hat{i} + 2\hat{j} + 2\hat{k}$. **(07 Marks)**

5 a. Find the maximum directional derivative of $\log(x^2 + y^2 + z^2)$ at (1, 1, 1). **(06 Marks)**

b. Find the unit normal vector to the curve $\vec{r} = 4\sin t\hat{i} + 4\cos t\hat{j} + 3t\hat{k}$. **(07 Marks)**

c. Show that $\vec{F} = \frac{x\hat{i} + y\hat{j}}{x^2 + y^2}$ is both solenoidal and irrotational. **(07 Marks)**

6 a. Find the Laplace transforms of $\sin^2 3t$ and $\sqrt{t}$. **(06 Marks)**

b. Find L[f(t)], given that $f(t) = \begin{cases} t-1 & 0 < t < 2 \\ 3-t & t > 2 \end{cases}$. **(07 Marks)**

c. Find the Laplace transform of $e^{2t}\cos t + t\,e^{-t}\sin 2t$. **(07 Marks)**

7 a. Find the Laplace transform of $\int_0^t \cos 2(t-u)\cos 3u\,du$. **(06 Marks)**

b. Find the inverse Laplace transform of

i) $\dfrac{s+1}{s^2-s+1}$ ii) $\dfrac{1}{s(s^2+a^2)}$. **(14 Marks)**

8 a. Find the inverse Laplace transform by using convolution theorem of $\dfrac{1}{(s^2+a^2)^2}$. **(10 Marks)**

b. By applying Laplace transform, solve the differential equation $\dfrac{d^2y}{dt^2}+5\dfrac{dy}{dt}+6y=5e^{2t}$.
Subject to the conditions $y(0)=2$, $y'(0)=1$. **(10 Marks)**

*****