Total No. of Questions : 5]

SEAT No. :

P4088

[Total No. of Pages : 3

[5039]-11
M.Sc. Tech. (Semester - I)
MATHEMATICS
Industrial Mathematics With Computer Applications
MIM - 101 : Real Analysis
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All the questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following: **[16]**

a) For $x, y \in \mathbb{R}$, define $d(x,y) = |x - 2y|$. Is d a metric on $\mathbb{R}$?Justify.

b) Let $f(x) = x^4$ and $\alpha(x) = 3x^2 + 10x + 9$ then evaluate the integral $\int_0^1 f d\alpha$.

c) Find the radius of convergence for the power series $\sum \frac{2^n}{n!} z^n$.

d) If $\{S_n\}$ is a sequence of real numbers converging to L then $\{S_n^2\}$ converges to L^2.

e) Discuss the convergence of the series. $\sum_{n=1}^{\infty} \frac{3}{n^2 + 3n - 1}$.

f) Define local maximum in a metric space X.

g) State Cauchy Mean value theorem.

h) Define the diameter of a subset A in a metric space X.

i) Define uniform convergence of sequence of functions $\{f_n\}$ on a subset E of a metric space X.

j) Define a dense subset E of a metric space X.

P.T.O.

Q2) a) Attempt any one of the following: **[6]**

i) Suppose $K \subset Y \subset X$. Then prove that K is compact relative to X if and only if K is compact relative to Y.

ii) Prove that $\lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n = e.$

b) Attempt any two of the following: **[10]**

i) Show that compact subsets of a metric space are closed.

ii) Prove that $\int_a^{\bar{b}} f \le \int_a^{\bar{b}} f$.

iii) Given f is differentiable on (a,b). If $f'(x) \ge 0$ for all $x \in (a,b)$ then show that f is monotonic increasing on (a,b).

Q3) a) Attempt any one of the following: **[6]**

i) Prove that $f \in \mathbb{R}(\alpha)$ on $[a,b]$ if and only if given $\in > 0$ there exists a partition P such that $U(P, f, \alpha) - L(P, f, \alpha) < \in$.

ii) If f is a continuous mapping of a metric space X in to a metric space Y and if E is a connected subset of X then prove that. $f(E)$ is connected in Y.

b) Attempt any two of the following: **[10]**

i) If $S_1 = \sqrt{2}$ and $S_{n+1} = \sqrt{2 + \sqrt{S_n}}$ then show that S_n is monotonic increasing bounded above.

ii) Consider the function.

$$f(x) = \begin{cases} x^2 \sin\left(\frac{1}{x}\right) & (x \neq 0). \text{ Show that } f' \text{ is not continuous at } x = 0 \\ 0 & (x=0) \end{cases}$$

iii) For $x, y \in \mathbb{R}$ define $d(x,y) = \frac{|x-y|}{1+|x-y|}$. Show that d (x,y) is a metric on $\mathbb{R}$.

Q4) a) Attempt any one of the following: **[6]**

i) Prove that every K-cell is compact.

ii) Prove that if f is continuous on [a,b] then $f \in \mathbb{R}(\alpha) \text{on} [a,b]$.

b) Attempt any two of the following: **[10]**

i) If $C_0 + \frac{C_1}{2} + \frac{C_3}{3} + ...\frac{C_{n-1}}{n} + \frac{C_n}{n+1} = 0$ where C_0, C_1,..... C_n are constants prove that the equation $C_0+C_1x+C_2x^2+..... C_nx^n = 0$ has atleast one root between 0 and 1.

ii) Prove that for any collection $\{G\alpha\}$ of open sets U_α G_α is open.

iii) Prove that a mapping f of a metric space X in to a metric space Y is continuous if and only if $f^{-1}(V)$ is open in X for every V open in Y.

Q5) Attempt any two of the following: **[16]**

a) State and prove the Fundamental Theorem of Calculus.

b) Let $f_n(x) = n^2x(1-x^2)^n$ where $0 \le x \le 1$ and n = 1, 2, 3.....

Show that $\int_0^1 \lim_{n\to\infty} f_n(x)\,dx \neq \lim_{n\to\infty} \int_0^1 f_n(x)\,dx.$

c) Prove that $\{P_n\}$ is a sequence in a compact metric space X, then some sub-sequence of $\{P_n\}$ converges to a point of X.

Total No. of Questions : 5]

SEAT No. :

P4089

[Total No. of Pages : 3

[5039]-12

M.Sc. Tech. (Semester - I)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 102 : Algebra - I

(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***

Q1) Attempt any eight of the following : **[8 × 2 = 16]**

a) Let G be a group of all 2 × 2 non-singular matrices with real entries, under matrix multiplication. Show that $H = \left\{ \begin{bmatrix} a & 0 \\ 0 & a \end{bmatrix} / a \neq 0 \text{ in } \mathbb{R} \right\}$ is normal subgroup of G.

b) Say true or false and justify your answer : "Every proper subgroup of a group of order 77 is cyclic".

c) Find the order of the permutation $\sigma = (1,2,3)(3,2)(1,2)$.

d) Define unit in a ring. Find the units in the ring of integers $\mathbb{Z}$.

e) If 'a' is generator of a cyclic group G, show that a^{-1} is also a generator.

f) Is every integral domain a field? Justify your answer.

g) If R is a ring with unity 1 and ϕ is a ring homomorphism of R onto R^1 prove that, $\phi(1)$ is the unity of R^1.

h) Give an example of a subring of a ring which is not an ideal.

i) Find characteristics of the following rings.

   i) $2\mathbb{Z}$

   ii) $\mathbb{Z}_3 \times \mathbb{Z}_4$

j) Is $x^3 + 2x + 3$ an irreducible polynomial in $\mathbb{Z}_5[x]$? Justify your answer.

P.T.O.

Q2) A) Attempt any <u>one</u> of the following : **[1 × 6 = 6]**

a) Prove that every subgroup of a cyclic group is cyclic.

b) State and prove the necessary and sufficient conditions for a non-empty subset H of a group G to be a subgroup.

B) Attempt any <u>two</u> of the following : **[2 × 5 = 10]**

a) Show that any subgroup of a group of index 2 is normal subgroup.

b) Let $\sigma = (2,3,1,4)(4,6)(2,1,5)$ be a permutation in S_6. Check whether 'σ' is even or odd permutation.

c) If G is a finite group of prime order, then show that G is cyclic group.

Q3) A) Attempt any <u>one</u> of the following : **[1 × 6 = 6]**

a) Let G be a group and $0(G) = P^2$, where 'p' is a prime number. Prove that G is abelian.

b) Let ϕ be a homomorphism of a group G onto $\overline{G}$ with kernel K. Prove that $\frac{G}{K} \cong \bar{G}$.

B) Attempt any <u>two</u> of the following : **[2 × 5 = 10]**

a) Prove that a group of order 42 is not simple.

b) Let N and M be two normal subgroups of a group G such that $N \cap M = \{e\}$ show that $n \cdot m = m \cdot n, \forall\ n \in N\ \&\ \forall\ m \in M$.

c) Define : conjugacy class. Find conjugacy classes of S_3.

Q4) A) Attempt any <u>ONE</u> of the following : **[1 × 6 = 6]**

a) Prove that a commutative ring R with unity is integral domain if and only if cancellation laws hold in R.

b) Let R be a commutative ring with unity and M be a maximal ideal of R, then prove that $\frac{R}{M}$ is a field.

B) Attempt any two of the following : **[2 × 5 = 10]**

a) Find all prime ideals of $\mathbb{Z}_{10}$.

b) Prove that the homomorphism ϕ of a ring R onto the ring R' is an isomorphism if and only if Kernel of ϕ is $\{0\}$.

c) Let $U = < x^2 + x + 4 >$ be an ideal of $\mathbb{Z}_{11}[x]$ generated by $x^2 + x + 4$.

Show that $\mathbb{Z}_{11}[x]/U$ is a field.

Q5) A) Attempt any <u>one</u> of the following : **[1 × 6 = 6]**

a) State and prove division algorithm for polynomials ring $F[x]$, where F is a field.

b) Prove that if R is integral domain then so is polynomial ring R [x].

B) Attempt any <u>two</u> of the following : **[2 × 5 = 10]**

a) Find all units in the ring of Gaussian integers $\mathbb{Z}[i]$. Further, if a + ib is not a unit in $\mathbb{Z}[i]$, show that $a^2 + b^2 > 1$.

b) If 'p' is a prime number, show that the polynomial $f(x) = 1 + x + x^2 + ... + x^{p-1}$ is irreducible over rationals.

c) Prove that the product of two primitive polynomials is a primitive polynomial.

Total No. of Questions : 4]

P4090

SEAT No. :

[Total No. of Pages : 3

[5039]-13
M.Sc. Tech. (Semester - I)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 103 : Discrete Mathematical Structures - I
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following: **[16]**

a) Find the conjunction and disjunction of propositions.

P: Today is Friday.

q: It is raining today.

b) Write truth table of $\sim(p \rightarrow \sim q)$.

c) Define : Predicate and n place predicate.

d) Define : Partioally ordered set. Totally ordered set.

e) State pigeonhale principle give one example.

f) Define: Semigroup monoid.

g) How many three digit numbers can be formed by using 1,2,3,4,5 without repetition of digits?

h) State principle of duality.

Write dual of $(a \vee \bar{b}) = 0$

i) Negate the following statements.

i) $\forall x\ (x^2 > 1)$

ii) $\forall x \exists y\ [x + y = 1]$

j) Draw Hasse diagram for 'greater than or equal to' on {0,1,2,3,4,5}.

P.T.O.

Q2) Attempt any four of the following: **[24]**

a) Find disjunctive normal form of f $(x_1, x_2, x_3) = (x_1 + x_2).\ x_3$

Also define minterm.

b) Test the validity of the following argument.

"IF it rains then I carry an umbrella' If it shines then I do not need a sweater'. Either it rains or it shines'. 'I do need a sweater'. Hence I carry on Umbrella.

c) How many integers between 1 and 1000 are divisible by 2 or 3 or 5?

d) Prove that in Boolean algebra.

i) $\overline{x \vee y} = \overline{x} \wedge \overline{y}$

ii) $\left(\overline{x \wedge y}\right) = \overline{x} \vee \overline{y}$

e) Prove :

i) $(p \to q) \wedge (p \to r) \equiv p \to (q \wedge r)$

ii) $(p \to q) \vee (p \to r) \equiv p \to (q \vee r)$

Q3) Attempt any four of the following: **[24]**

a) Write a note on Quine -Mc Cluskey method.

b) Construct circuit gate diagrams that produce following output.

i) $(x + y)\overline{x}$

ii) $\overline{x}\overline{(y + \overline{z})}$

c) Show that commutative laws, absorption laws and Idempotent laws held's for lattice L, $\forall$ x, y $z \in L$

d) List all possible functions from set A = {a,b,c,} to set B = {x,y}

e) Write a note on Isomorphism and homomorphism of semigroups.

Q4) Attempt any four of the following: **[16]**

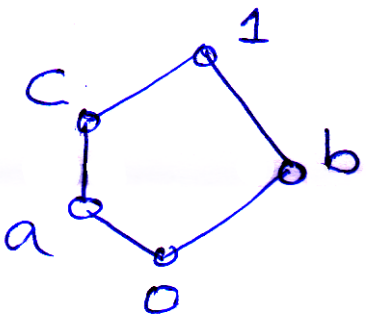
a) Find karnaugh map

for $x\,\overline{y} + \overline{x}\,y$

b) Give direct proof for

$p \vee q\ p \rightarrow r, \sim r \vdash q$

c) Is following lattice distributive? Justify.



d) Explain product and quotients of semigroups.

e) Describe indirect method of proof.

Total No. of Questions : 5]

P4091

SEAT No. :

[Total No. of Pages : 2

[5039]-14

M.Sc. Tech. (Industrial Mathematics with Computer Applications)

MIM - 104 : C - Programming

(2008 Pattern) (Semester - I)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***All questions carry equal marks.***

Q1) Attempt any eight **[8 × 2 = 16]**

a) What is recursion?

b) State any two datatypes in C.

c) What is the difference between Null pointer and Null string?

d) State any 2 string operation functions.

e) What is the difference between malloc () and calloc() functions.

f) Distinguish between micro and function.

g) Explain:Global Variable Give an example.

h) What is command line arguments.

i)
```
main()
{
        printf("%d %d %d", size of(3.14f), size of(3.14), size of(3.141));
}
```

j) State any two keywords from C-language.

Q2) Attempt any 2: **[2 × 8 = 16]**

a) Write a C-program to subtract two matrices.

b) Write a C-program to accept the string from the user and to reverse the accepted string.

c) Write a C-program to copy one file to another file.

P.T.O.

Q3) Attempt any 4: **[4 × 4 = 16]**

a) What is the meaning of call by reference? Explain with example.
b) Write a note on bitwise operator.
c) Explain the difference between while and do-while loop with example.
d) State any four standard library functions with their use.
e) Write a note on any two storage classes.

Q4) Attempt any 4: **[4 × 4 = 16]**

a) Explain the concept of pointer to function with suitable example.
b) A file contains the information of a few employees in the structured format of name, age & bs. Write 'C' prog. which reads the information from the file & display it on the user screen.
c) Explain concept of nested structures with suitable example.
d) What is dynamic memory allocation?
e) Explain C-program development Life Cycle.

Q5) Attempt any 4: **[4 × 4 = 16]**

a) What would be the output of the following program.

```
# define PRINT (int) printf ("int = %d", int)
main ()
{int x = 2, y = 3, z = 4;
      PRINT (x);
      PRINT (y);
      PRINT (z);
}
```

b)
```
main ()
{
      struct emp
      {
            Char *n;
            int age;
};
struct emp el = {"Dravid", 23};
struct emp e2 = el;
strupr (e2.n)
printf ("\n%s", el.n);
}     Find the output.
```

c) What is the difference between Union and structure?
d) Write a note on Array.
e) Explain with example how structures are passed to functions.

Total No. of Questions : 5]

P4092

SEAT No. :

[Total No. of Pages : 2

[5039]-15
M.Sc. Tech. (Sem. - I)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPPLICATIONS
MIM - 105 : Elements of Information Technology
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of logarithmic table calculator is allowed.***

Q1) Attempt any eight of the following: **[8 × 2 = 16]**

a) What is logical file?

b) What is World Wide Web (WWW)?

c) Explain characteristics of a computer.

d) Define Input device. Give its example

e) Give the binary representation of following decimal numbers.

i) 22

ii) 1

f) What is multiprogramming System.

g) State and explain briefly any 2 types of file organization.

h) Explain the term EBCDIC code.

i) Define ROM. State different types of ROM.

j) What are features of multiprogramming operating system?

P.T.O.

Q2) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain working of Dot Matrix printer with diagram.

b) Discuss with necessary diagram, the basic structure of a computer.

c) Explain different services provided by operating system.

d) Discuss with suitable diagram working of bus topology.

e) Explain secondary memory and its devices.

Q3) Attempt any four of the following: **[4 × 4 = 16]**

a) Write a note on distributed system.

b) State and explain different networking protocols.

c) With suitable diagram explain the working of video display unit.

d) Explain different applications of networks.

e) What is heap file organization? Compare it with sequential file organization.

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain how an element is inserted in sparse index. Give suitable example.

b) Discuss physical and logical files. What are special characters in files?

c) Explain how the software is classified.

d) With neat diagram explain the operation of VDU monitor.

e) What are the different types of computer?

Q5) Attempt any two of the following: **[2 × 8 = 16]**

a) Explain the concept of Information Technology. Discuss any four of its applications.

b) Convert Decimal to Octal

i) 19 ii) 237

iii) 45 iv) 30

c) Explain the concept of software. In detail discuss the classification of software.

Total No. of Questions : 5]

P4094

SEAT No. :

[Total No. of Pages : 3

[5039]-22
M.Sc. Tech (Semester - II)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 202 : Algebra - II
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any Eight of the following. **[8 × 2 = 16]**

a) Show by an example that the union of two subspaces of a vector space need not be a subspace.

b) Find co-ordinates of (1,2,3) relative to the basis $\mathbb{B}$= {(1,2, –3), (1, –3,2), (2,–1,3)}

c) If V is an inner product space over a field $\mathbb{R}$, then for u,v,w, $\in$ V and, $\alpha, \beta \in \mathbb{R}$, Show that.

$$(u, \alpha v + \beta \omega) = \bar{\alpha}(u, v) + \bar{\beta}(u, \omega)$$

d) Find an eigen vector corresponding to the maximum eigen value of a matrix. A=$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

e) State: Rank - Nullity theorem for linear transformations.

f) Define: Field extension and degree of the extension.

g) Show that '$1+\sqrt{5}$' is algebraic over a field of rationals Q.

h) Construct a field with nine elements.

i) If E is an extension of a field F of degree 12, and $F \subseteq E'$ is subfield of E Is it possible that [E′:F] = 7? Justify your answer.

j) Define: Normal Extension.

P.T.O.

Q2) a) Attempt any ONE of the following. **[1 × 6 = 6]**

i) Let U,V be vector spaces over a field $\mathbb{F}$; and let T:U $\rightarrow$ V be a linear transformation from U into V and Let U be a finite dimensional vectorspace.

Prove that,

dim (U) = rank (T) + Nullity (T).

ii) Let $S = \{\nu_1, \nu_2 ... \nu_r\}$ be a set of vecrtors in $\mathbb{R}^n$. If r > n, prove that 'S' is linearly independent.

b) Attempt any TWO of the following: **[2 × 5 = 10]**

i) Let $B = \{1+x+x^2,\ -1+x,\ 1+2x+x^2\}$ be a basis for the vectorspace $\mathbb{P}_2$. Determine the co-ordinate vector of $P = 6+x+3x^2$ in $\mathbb{P}_2$, relative to B. Hence write the co-ordinate matrix of P relative to B.

ii) If u & v are two vectors in an inner product space V then show that

$$< u, \nu > = \frac{1}{4} \| u + \nu \|^2 - \frac{1}{4} \| u - \nu \|^2 .$$

iii) If $T:\mathbb{R}^3 \rightarrow \mathbb{R}^3$ is a linear transformation.

Such that T (1,0,0) = (1,0,-1)

T (1,1,0) = (1,2,3) and

T (1,0,1) = (0,0,1)

Find the formula for T.

Q3) a) Attempt any ONE of the following. **[1 × 6 = 6]**

i) Prove that an n - square matrix is diagonalizable if and only if it has n- linearly independent eigen vectors.

ii) If A is square matrix, then prove that 'A' satisfies its characteristic polynomial.

b) Attempt any TWO of the following: **[2 × 5 = 10]**

i) Find the basis and dimension of the eigen-space corresponding to the greatest eigenvalue of A, Where

$$A=\begin{bmatrix} 5 & -6 & -6 \\ -1 & 4 & 2 \\ 3 & -6 & -4 \end{bmatrix}$$

ii) Let $U = \{(x,y,z) \in \mathbb{R}^3 / 2x + 3y + z = 0\}$.
Show that U is a subspace of $\mathbb{R}^3$.

iii) Apply Gram - Schmidt process to obtain an orthonormal basis from the basis $\mathbb{B}$, where
$\mathbb{B} = \{(1,0,1), (1,-1,0), (1,1,1)\}$.

Q4) a) Attempt any ONE of the following. **[1 × 6 = 6]**

i) If $\mathbb{K}/\mathbb{F}$ and $\mathbb{F}/\mathbb{E}$ are algebraic extensions, then show that $\mathbb{K}/\mathbb{E}$ is an algebraic extension.

ii) Prove that the non-zero elements of a finite field $\mathbb{F}$ forms a cyclic group under multiplication.

b) Attempt any TWO of the following: **[2 × 5 = 10]**

i) Let $\mathbb{F}$ be a finite field of characteristic p.
Define. $\phi : \mathbb{F} \to \mathbb{F}$ by $\phi(a) = a^p$.
Show that ϕ is automorphism of $\mathbb{F}$.

ii) Find the splitting field of $x^3 - 2$ over the field of rational numbers. Also find its Galois group.

iii) Prove that a finite field of 'p^n' elements exists for every prime 'p' & $n \in \mathbb{N}$.

Q5) a) Attempt any ONE of the following. **[1 × 6 = 6]**

i) If $\mathbb{F} \subseteq \mathbb{E} \subseteq \mathbb{K}$ and, $[\mathbb{E}:\mathbb{F}] = m$, $[\mathbb{K}:\mathbb{E}] = n$, then prove that $[\mathbb{K}:\mathbb{F}] = m.n$

ii) If $f(x) \in \mathbb{F}(x)$, then prove that there is a finite extension $\mathbb{E}$ of $\mathbb{F}$ in which $f(x)$ has a root.

b) Attempt any TWO of the following: **[2 × 5 = 10]**

i) Find the degree and the basis for $Q\left(\sqrt{3}+\sqrt{5}\right)$ over $Q\left(\sqrt{15}\right)$

ii) Show that the splitting field of $x^5 - 1 \in Q[x]$ is of degree 4.

iii) Show that $f(x) = x^3 - 3x^2 + 3x - 3$ is an irreducible polynomial over Q.

❍❍❍

Total No. of Questions : 4]

P4095

SEAT No. :

[Total No. of Pages : 3

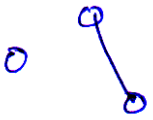
[5039]-23
M.Sc. (Tech) (Semester - II)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 203 : Discrete Mathematical Structures - II
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

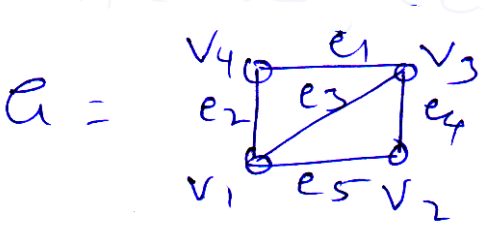
1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following. **[8 × 2 = 16]**

a) Define: component find component in 

b) Define : subgraph. Give one example.

c) Write adjacency matrix for



d) Define :

i) Walk

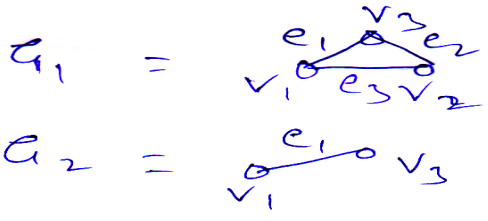
ii) Path in a graph G.

e) Draw a graph which is one colourable.

f) Define : Isthmus Give one example.

g) Does there exists a regular graph of degree 5 on nine vertices?

h) If



Find $G_1 \cup G_2$, $G_1 \cap G_2$

i) State hand shaking lemma.

j) Define : Pendant vertex in a tree.

P.T.O.

Q2) Attempt any <u>four</u> of the following. **[24]**

a) Prove that if G is a connected planar graph with p vertices, q edges and r faces then p- q+r =2

b) Prove that every tree has either one or two adjacent centres.

c) Define:

i) Indegree and outdegree of a vertex in a digraph.

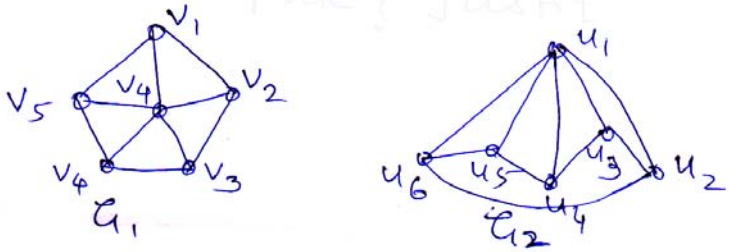
ii) Balanced digraph.

iii) Simple asymmetric digraph.

iv) Complete symmetric digraph.

v) Arborescence.

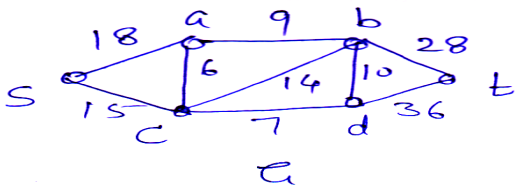
d) Are the following 2 graphs isomorphic? Justify.



e) Discuss depth first search (DFS) algorithm.

Q3) Attempt any <u>Three</u> of the following **[24]**

a) Using Dijkstra's algorithm find the shortest S - t path in graph G.



b) Consider connected graph G and its spanning tree T

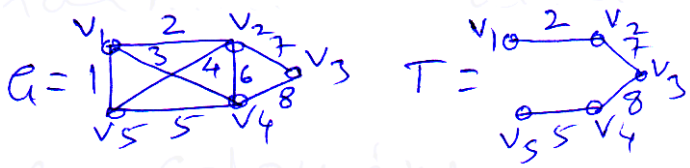
Find

i) All branches of T

ii) All chords of T.

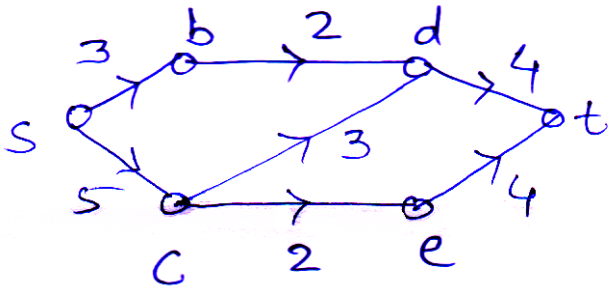
iii) List all fundamental circuits of G w.r.t. T

iv) List all Fundamental cut sets of G w.r.t. T



c) Define : Vertex colouring write down largest first sequential algorithm for vertex colouring. Illustrate with an example.

d) What is max - flow min cut theorem? Determine maximum flow in the given network by using ford - fulkerson algorithm. Find value of the maximal flow.



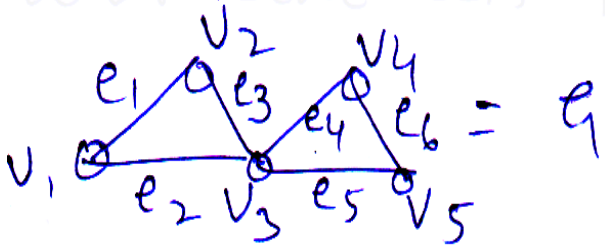
Q4) Attempt any <u>four</u> of the following. **[16]**

a) Show that the number of vertices in a self complementary graph must be of the form 4k or 4k+1 where k is a positive integer.

b) Prove that a connected graph G is an Euler graph if and only if it can be decomposed into circuits.

c) Define : rooted tree. Show that the number of vertices 'n' of a binary tree is always odd.

d) Using fleury's algorithm find Euler line in following graph G



e) Prove that a simple graph with n vertices and K components can have at most (n–k) (n–k+1)/2 edges.

Total No. of Questions : 5]

P4096

SEAT No. :

[Total No. of Pages : 3

[5039]-24
M.Sc. Tech (Semester - II)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 204 :Database Fundamentals
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following. **[8 × 2 = 16]**

a) Define:
   i) Super Key.
   ii) Database system.

b) What is the use of project() in relational algebra?

c) What is degree of relationship? Explain with example.

d) Write any two advantages of DBMS file system.

e) Give difference between primary key and candidate key.

f) What is referential integrity constraint? Explain.

g) What is derived attribute? Explain with example.

h) Explain weak entity and strong entity set.

i) Define: Schema.

j) State any two aggregate functions used in SQl.

Q2) Attempt any four of the following. **[4 × 4 = 16]**

a) Draw and explain structure of database system.

b) Write a note on functional components of DBMS.

c) State and explain different types oF relationships that can exists in entity sets in an ER model.

d) Explain different types of integrity constraints.

e) What is functional dependency? Explain.

P.T.O.

Q3) Attempt any four of the following. **[4 × 4 = 16]**

a) Differentiate between specialization and generalization.

b) What is data model? Explain its types.

c) Write a short note on: Data Independence.

d) What is decomposition? Explain lossless join decomposition.

e) Consider following relations.

Food(food-id,fname,weight)

Ingredient(in_id,iname,quantity)

Food and ingredient are related with many-to-many relationship having quantity as a descriptive attribute.

Write relational algebra queries for the following

i) List names of food products of weight more than 5kg.

ii) List names of ingredients not used in any food product.

Q4) Attempt any four of the following. **[4 × 4 = 16]**

a) State and explain types of set operations used in relations.

b) Explain different DML statements used in SQL.

c) Explain following relational algebra operators with examples

i) Join

ii) Rename

iii) Assignment

iv) Cartesian product.

d) Design an E-R diagram for banking enterprise which records information about customers, employees of bank. A customer can be depositor or borrower. An employees of bank can be customer of the bank. There are two types of accounts, saving or current.

e) Write a short note on Cursers.

Q5) Attempt any four of the following. **[4 × 4 = 16]**

a) What are insertion and deletion anomalies? Explain with example.

b) F={A->B,CD->E,A->c,B.->D,E->A} compute the closure of F. i.e. F^+

c) Consider following entities and relationship

game(gno, gname,no-of-player,coach-name, captain)

player(pno,pname)

game and player are related with many-to-many relationship create RDB to solve following queries.

i) Count the total no of players whose coach name is “Mr. Sachin”.

ii) List the name of players playing football or cricket.

d) Explain different symbols used in E-R diagram.

e) What is attribute? Explain different type of attribute.

Total No. of Questions : 5]

P4097

SEAT No. :

[Total No. of Pages : 3

[5039]-25
M.Sc. Tech (Computer Science)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 205 : Data Structures Using C
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following. **[16]**

a) Define data structure stack with its applications.

b) Differentiate between stack and array.

c) What is queue? Explain primitive operations on queue.

d) What is meant by in-place sorting?

e) Differentiate between static and dynamic memory allocation.

f) Define strictly binary tree.

g) List any two graph traversal techniques and the data structure used In them.

h) What is graph? Explain the term isolated vertex.

i) State any two advantages of doubly linked list.

Q2) Attempt any four of the following. **[16]**

a) Write a function to count the number of nodes in a given tree.

b) Write a 'C' Program to implement circular queue.

c) Write following 'C' functions for static queue representation.

   i) DeleteQ()

   ii) Isempty Queue()

d) Sort the following numbers using bubble sort
3,97,65,71,23,57,93,100.

e) Explain different operations that can be performed on linked list.

P.T.O.

Q3) Attempt any four of the following. **[16]**

a) Write the algorithm to convert prefix expression to infix expression.

b) Describe array and linked list representation of binary trees.

c) Explain need of dynamic implementation of stack.

d) Write a short note on array as ADT.

e) Write a function in 'C' to insert a node in a BST.

Q4) Attempt any four of the following. **[16]**

a) Represent following expressions as binary tree

i (A+B*C)/((A+B)*C)

ii) (A+B)*C

b) Convert following infix expression to postfix expression and evaluate. a=1,b=3,c=4,d=2. Show stack contents for evaluation.

i) a*b-c/d

c) Define the terms:

i) Node.

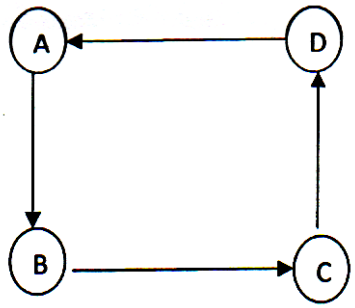
ii) Leaf.

iii) Siblings

iv) Depth of tree

d) Write a program to implement "push" and "pop" operation of stack using linked list.

e) Construct adjacency list for the following graph



Q5) Attempt any four of the following. **[16]**

a) What are the differences between stack and Queue.

b) Write time complexity of merge sort for best case, average case and worst case.

c) Write an algorithm to implement insertion sort.

d) Write a any four applications of queue.

e) Write a 'C' program to insert and delete and display an element in doubly linked list

Total No. of Questions :5]

SEAT No. :

P3126

[Total No. of Pages :5

[5039] - 31

M. Sc.Tech.

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 301: Numerical Analysis

(2008 Pattern) (Semester - III)

Time : 3 Hours] *[Max. Marks :80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable scientific calculator is allowed.***

Q1) Attempt any EIGHT of the following: **[8×2=16]**

a) Find absolute error and relative error in the approximation of 'x' where

$x = 4.71828182$

$\bar{x} = 4.7182$

b) For the function $f(x) = e^x - 2 - x$, find an interval $[a, b]$ such that $f(a)$ and $f(b)$ have opposite signs.

c) Find fixed point, if any, of

$$g(x) = 1 + x - \frac{x^2}{4}$$

d) Write a formula for Lagrange's interpolating polynomial through the points $(x_0, y_0), (x_1, y_1)$ and (x_2, y_2).

e) Find real root of the equation $x^2 - 9 = 0$, by bisection method which lies in the interval [2, 4].

f) Define ill conditioned system.

P.T.O.

g) State: Simpson's $\frac{3}{8}^{th}$ rule.

h) Define: Dominant eigen vector.

i) Show that the matrix

$$A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$$ is orthogonal.

j) Let λ and ν be an eigen pair of a matrix A. If α is any constant, show that $\lambda - \alpha$, ν is an eigen pair of matrix A - α I.

Q2) A) Attempt ANY ONE of the following: **[1×6=6]**

a) Assume that $f \in C^2[a, b]$ and there exists a number $p \in [a, b]$, where $f(p) = 0$. If $f'(p) \neq 0$, then there exists a $\delta > 0$ such that the sequence $\{p_k\}_{k=0}^{\infty}$ defined by the iteration

$$p_k = g(p_{k-1}) = p_{k-1} - \frac{f(p_{k-1})}{f'(p_{k-1})} \text{ for } k = 1, 2, ...$$

will converge to 'p', for $p_0 \in [p - \delta, p + \delta]$

b) Derive Newton's forward difference formula.

B) Attempt any TWO of the following: **[2×5=10]**

a) Use false position method to find root of $x \sin(x) - 1 = 0$ that is located in the interval [0, 2]

(Function sin (x) is evaluated in radians).

b) Assume that 'g' is a continuous function and that $\{p_n\}_{n=0}^{\infty}$ is a sequence generated by fixed point iteration. If $\lim_{n\to\infty} p_n = p$ then 'p' is a fixed point of $g(x)$.

c) Find the parabola $y = A + Bx + Cx^2$ that passes through the three points (1, 1), (2, –1), (3, 1).

Q3) A) Attempt any ONE of the following: **[1×6=6]**

a) Derive Newton – cotes formulas for integration.

b) Consider $f(x) = x^N - A$, where N is a positive integer. Derive the recursive formula

$$p_k = \frac{(N-1)\, p_{k-1} + \dfrac{A}{p_{k-1}^{N-1}}}{N}, \quad k = 1, 2, ...$$

for finding the N^{th} root of A.

B) Attempt any TWO of the following: **[2×5=10]**

a) Find the Jacobian matrix J (x, y, z) of order 3 × 3 at the point (1, 3, 2) for the following functions:

$$f_1(x, y, z) = x^3 - y^2 + y - z^4 + z^2$$
$$f_2(x, y, z) = xy + yz + xz$$
$$f_3(x, y, z) = \frac{y}{xz}$$

b) Find the inverse of the matrix 'A' using Gauss elimination method.

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

c) From the following data, obtain the value of $f(x) = x^{1/2}$ at $x = 4.5$

k	x_k	$f(x_k)$
0	4.0	2.0000
1	5.0	2.2360
2	6.0	2.4494
3	7.0	2.64575
4	8.0	2.8284

Q4) A) Attempt any ONE of the following: **[1×6=6]**

a) Assume that $f \in C^3[a,b]$ and that $x-h, x, x+h \in [a,b]$. Then show that $f'(x) \approx \dfrac{f(x+h)-f(x-h)}{2h}$

Also show that there exists a number $c = C(x) \in [a,b]$ such that

$$f'(x) = \frac{f(x+h)-f(x-h)}{2h} + E_{trunc}(f,h)$$

where $E_{trunc}(f,h) = \dfrac{-h^2 f^{(3)}(c)}{6}$.

b) The following table gives values of x and y, where *'y'* is cubic function of *'x'*.

x	0	1	3	4
y	1	4	40	85

Determine the function $f(x)$.

B) Attempt any TWO of the following: **[2×5=10]**

a) Determine the largest eigen value and the corresponding eigenvector of the matrix 'A'.

$$A = \begin{bmatrix} 3 & -1 & 0 \\ -1 & 2 & -1 \\ 0 & -1 & 3 \end{bmatrix}$$

b) Use Euler's method to solve approximately the initial value problem

$y' = Ry$ over [0,1], with initial conditions $y(0) = y_0$ and R is any constant.

c) Solve the following system of linear equations: by Jacobi's method. Carry out computations upto two places of decimals.

$$10x + 2y + z = 9$$
$$2x + 20y - 2z = -44$$
$$-2x + 3y + 10z = 22.$$

Q5) Attempt any TWO of the following: **[2×8=16]**

a) Obtain LU - Decomposition of matrix 'A'

$A = \begin{bmatrix} 2 & 4 & -6 \\ 1 & 5 & 3 \\ 1 & 3 & 2 \end{bmatrix}$ and hence solve LY = B, UX = Y and verify B = AX.

Where $B = [-4,\ 10,\ 5]^t$

b) Use Runge - Kutta method of order 4 to solve initial value problem

$y' = \frac{t-y}{2}$ on [0, 3] with $y(0) = 1$; by taking step size $h = 0.25$.

c) Given that

$\frac{dy}{dx} = \sqrt{xy} + 2$ with initial conditions $y(1) = 1$.

Find the value of $y(2)$ in steps of 0.1 using Euler's modified method.

d) Consider the integration of the function $f(x) = 1 + e^{-x} \sin(4x)$ over the fixed interval [a, b] = [0, 1]. Apply the various Simpson' s $\frac{1}{3}^{rd}$ and Simpson's $\frac{3}{8}^{th}$ formulas to obtain $\int_a^b f(x).dx.$

[Take sin (4x) values in Radian].

Total No. of Questions : 5]

P4098

SEAT No. :

[Total No. of Pages : 3

[5039]-32
M.Sc. Tech.
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 302 : Object Oriented Software Engineering
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following. **[8 × 2 = 16]**

a) Define System dependability.

b) Define the software reliability.

c) Give any two challenges facing Software Engineering.

d) What is a software process?

e) What is software inspection?

f) Define: feasibility study.

g) What are critical systems?

h) Write two advantages of using inspection over testing.

i) Define :

   i) Fat client

   ii) Thin client

j) Give the attributes of good software.

Q2) Attempt any four of the following. **[4 × 4 = 16]**

a) Explain the client server architecture.

b) Explain the Spiral model.

c) Write a note on Socio technical systems.

d) Explain clean room software development.

e) Explain Component testing.

P.T.O.

Q3) Attempt any four of the following. **[4 × 4 = 16]**

a) Write note on Agile methods.

b) Briefly explain the stages of object oriented design.

c) Explain the tools used in Rapid Application Development (RAD).

d) How verification and validation techniques are useful in System?

e) Explain the three basic User Analysis techniques.

Q4) Attempt any two of the following. **[2 × 8 = 16]**

a) Draw a class diagram for the following: An employee in an organization is categorized as a Manager and a Programmer. The Manager is responsible for budget control and date of appointment. The Manager is further classified as Project Manager, Department Manager and Strategic Manager. The Programmer focuses on programming languages and Project. Model the classes properly by giving atleast two attributes for each class.

b) Draw a sequence diagram for the following scenario. In a personal computer, a disk controller is typically used to transfer a stream cf bytes from a floppy disk drive to a memory buffer with the help of CPU. The controller signals the CPU each time a new byte is available. The date is then read and stored before another byte is ready. The disk controller senses that data is read and signals that the data is not available. If any byte is not read before the next comes along, the disk controller goes into a data lost error state. The host can then reset the disk controller back into data not available state to continue the process.

c) Consider a system for processing results of the students. The student fills in the examination form giving details about subject and centre etc., which is an input to the system. Student pay examination fees and is given a fee receipt and the admit card. Examination is conducted at various centres. Centres provide the absentee report. The evaluation department provides marks of the students in each subject. The marksheet and the merit list are the outputs of the system. Draw:

i) Context level diagram.

ii) Data flow diagram(1^{st} level DFD).

Q5) Attempt any four of the following. **[4 × 4 = 16]**

a) Explain Waterfall Model.

b) Give the four main phases of requirement engineering process and explain it in brief.

c) What is feasibility study? Explain different types of feasibility studies.

d) What is the goal of test case design process? Give various approaches taken for test case designing.

e) Explain Integration testing in detail.

Total No. of Questions : 5]

P4099

SEAT No. :

[Total No. of Pages : 2

[5039]-33
M.Sc. Tech.
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 303 : Object Oriented Programming In Java
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following. **[8 × 2 = 16]**

a) What are command line arguments?

b) Define Encapsulation.

c) What is a Wrapper class and state its use?

d) What is the use of final keyword with a class and a method?

e) What is an event?

f) Describe Finalizer method.

g) 'A try block must have a catch block'. State true/false and justify.

h) What is the use of finally block?

i) What is the major difference between ArrayList and LinkedList?

j) Define the term Collection.

Q2) Attempt any four of the following. **[4 × 4 = 16]**

a) Explain Exception Handling mechanism in Java.

b) Differentiate between Vector and Arrays.

c) Write short note on Adapter classes.

d) Explain Garbage collection in Java.

e) Explain core collection interfaces.

P.T.O.

Q3) Attempt any two of the following. **[2 × 8 = 16]**

a) Explain the interface concept with suitable examples.

b) Write a program, which will read a string and rewrite it in alphabetical order. For eg, the word STUDENT should be written as DENSTTU.

c) Read two two - dimensional arrays 'A' and 'B' sort them in ascending order. Merge them into a single sorted array 'C' that contains every item from A and B, in ascending order. Write a program for the above mentioned task of reading arrays, sorting them and merging them.

Q4) Attempt any two of the following. **[2 × 8 = 16]**

a) Explain the event handling mechanism in java.

b) Define an exception that is called 'No Match Exception' that is thrown when an string is not equals to 'Mathematics'. Write a program that will use this exception.

c) Create a GUI based program containing list box, Text box list any 5 city names in list box. When any name in the list box will be selected, show its reverse in the text box.

Q5) Attempt any four of the following. **[4 × 4 = 16]**

a) What is a Layout Manager? Explain Flow Layout and Border layout with example.

b) Explain Streams and its types.

c) Explain the characteristics of constructor and state its types.

d) Explain the concept of polymorphism.

e) Differentiate : do ...while and while loop. Give suitable example.

Total No. of Questions :6]

SEAT No. :

P3101

[Total No. of Pages :2

[5036] - 34

M.Sc.

BIOTECHNOLOGY

BT - 33 b : Advanced Immunology

(2008 Pattern) (Semester - III)

Time : 1½ Hours] *[Max. Marks :40*

Instructions to the candidates:

1) ***Attempt a total of four questions selecting atleast two questions from each section.***
2) ***Answer to the sections must be written on separate answer books.***
3) ***Neat diagrams must be drawn wherever necesssary.***
4) ***Figures to the right indicates full marks.***

SECTION - I

Q1) a) Describe the structure and rate of spleen. **[5]**

b) Give a brief account of T - cell and signal transduction. **[5]**

Q2) a) Explain classical Pathway of complementary system. **[5]**

b) Discuss the various barriers of innate immunity. **[5]**

Q3) Write explanatory notes on:-

a) Acute rejection of graft. **[5]**

b) Myasthenia gravis. **[5]**

SECTION - II

Q4) a) Give a concise account of Nude - Mouse Model. **[5]**

b) Write the steps of phage display technology. Mention its significance. **[5]**

P.T.O.

Q5) a) Write a note on applications of stem cells. **[5]**

b) Differentiate between inovovatent and poly valent vaceines with example of each. **[5]**

Q6) Write explanatory notes on:- **[10]**

a) Parasitic immunology.

b) Hybridoma technology.

Total No. of Questions : 5]

P4101

SEAT No. :

[Total No. of Pages : 3

[5039]-35
M.Sc. Tech
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 305 : Theorotical Computer Science
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following: **[8 x 2= 16]**

a) Define E-closure of a state.

b) Give language generated by following regular expression 010*

c) Define DFA.

d) Show that grammar E $\rightarrow$ EE/c/d is ambiguous.

e) Construct DFA for the language over alphabet {0,1} with odd number of 1/5.

f) What is meant by useless symbol?

g) Write regular expression over {0,1}. For all strings ending with 01.

h) Define ID of turing Machine.

i) Define language accepted by PDA.

j) Construct NFA with t-moves for (10)*.

Q2) a) Attempt any one : **[1 × 6 = 6]**

i) Design more machine for a language over alphabet {0,1} which outputs * if string contains '11' in it and outputs.

otherwise. Convert it into a mealy machine.

P.T.O.

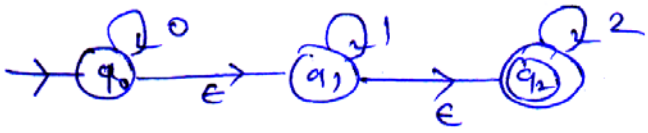
ii) minimize following DFA.

	δ	0	1	
	A	B	A	
	B	A	C	
	C	D	B	
*	D	D	A	
	E	D	F	
	F	G	E	
	G	H	E	{D is final state}
	H	G	D	

b) Attempt any two:

i) Design DFA to check whether given decimal number is divisible by 3. **[10]**

ii) Convert following NFA to DFA



iii) Show that L = {a^p/p is prime}
is not regular.

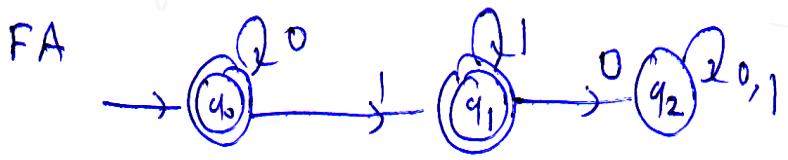
Q3) a) Attempt any one : **[6]**

i) Show that CFG's are closed under union, concatenation & Kleene closure.

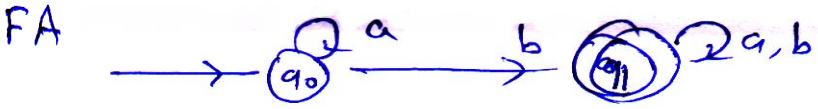
ii) Construct FA for [(0+1)* (1+0) (0+1)*]

b) Attempt any two : **[10]**

i) Find regular expression for following.



ii) Construct regular grammar for following.



iii) Construct CFG for the language.
L= {a^n b^n / n ≥ 0}

Q4) a) Attempt any one : **[6]**

i) Convert following CFG to GMF

$S \rightarrow AA/0$

$A \rightarrow SS/1$

ii) Convert following CFG to CNF

$S \rightarrow aAbB/ABC/a$

$A \rightarrow aA/a$

$B \rightarrow bB/bC$

$C \rightarrow abc$

b) Attempt any two : **[10]**

i) Construct PDA for the language

$L = \{0^m 1^n\}/m_1 n \geq 1$

ii) Construct an equivalent grammar after removing useless symbols for following CFG.

$S \rightarrow ACH/BB$

$A \rightarrow Aa/Fa$

$B \rightarrow CFH/b$

$C \rightarrow aC/DH$

$D \rightarrow aD/BD/ Ca$

$H \rightarrow dH/d$

iii) Construct Turing machine for the language $L = \{WW^R/w \leftarrow \{a,b\}^k\}$

W^R is reverse of W e.g

if $W = 011$ then $W^R = 110$

Q5) a) Attempt any one : **[1 × 6 = 6]**

i) Explain the process to convert CFG to PDA with an example.

ii) Construct PDA for following grammar.

$S \rightarrow OAC$

$A \rightarrow OAC/OB/1$

$B \rightarrow 1B/1$

$C \rightarrow 1$

b) Attempt any one : **[10]**

i) Explain chomsky Heirarchy.

ii) Explain Universal Turing machine.

iii) Show that if L_1 is CFL & L_2 is CFL, $L_1 \cap L_2$ may not be CFL.

Total No. of Questions : 5]

SEAT No. :

P3127

[Total No. of Pages : 2

[5039]-41
M.Sc. Tech.
MATHEMATICS
Industrial Mathematics with Computer Applications
MIM-401:Topology
(2008 Pattern) (Semester-IV)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All the questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following. **[16]**

a) Define Topology on a set X.

b) Given τ_1 and τ_2 are topologies on a set X. Is $\tau_1 \cup \tau_2$ a topology on X. Justify!

c) Show that projection maps π_1 and π_2 are open.

d) State Urysohn Lemma.

e) Show that a subspace of a Hausdroff space is Hausdroff.

f) State Finite Intersection Property.

g) Define a Locally Connected Topological space.

h) Define the diameter of a subset A in a metric space X.

i) Define a Locally Compact Topological space.

j) State Tychonoff theorem.

Q2) a) Attempt any one of the following. **[6]**

i) State and prove Sequence Lemma.

ii) Prove that every compact subspace of a Hausdroff space is closed.

b) Attempt any two of the following. **[10]**

i) Give an example of a topological space which is connected but not path connected.

ii) Show that a finite union of compact subspaces of X is compact.

iii) Show that the product of two Lindelof spaces need not be Lindelof.

P.T.O.

Q3) a) Attempt any one of the following. **[6]**

i) Give an example of a Topological space which is Hausdroff but not regular.

ii) State and prove Extreme value theorem.

b) Attempt any two of the following. **[10]**

i) Prove that Compactness implies Limit Point Compactness.

ii) Let $f : \mathrm{A} \to X \times Y$ given by $f(\mathrm{a}) = (f_1(\mathrm{a}), f_2(\mathrm{a}))$. Then show that f is continuous if both $f_1 : \mathrm{A} \to \mathrm{X}$ and $f_2 : \mathrm{A} \to Y$ are continuous.

iii) If $f : X \to Y$ is continuous and A is a subspace of X, then prove that the restriction function $f|_{\mathrm{A}} : \mathrm{A} \to \mathrm{Y}$ is continuous.

Q4) a) Attempt any one of the following. **[6]**

i) State and prove Pasting Lemma.

ii) State and prove Tube Lemma.

b) Attempt any two of the following. **[10]**

i) Show that continuous image of path connected space is always path connected.

ii) Show that every finite point set in a Hausdroff space is closed.

iii) Prove that the image of connected space under a continuous map is connected.

Q5) a) Attempt any one of the following. **[6]**

i) Prove that every metrizable space is normal.

ii) State and prove Intermediate value theorem.

b) Attempt any two of the following. **[10]**

i) Let $f, g : X \to Y$ be continuous where Y is an ordered set with ordered topology.Show that the set $\{x \mid f(x) \leq g(x)\}$is closed in X.

ii) Show that the map F:(-1,1) $\to$ $\mathbb{R}$ defined by F $(x) = \dfrac{x}{1-x^2}$ is a homomorphism.

iii) Let X be a topological space with topology τ.If Y is a subset of X then show that the collection $\tau_y = \{Y \cap U \mid U \in \tau\}$ is a topology on Y called as the subspace topology.

Total No. of Questions : 5]

P4102

SEAT No. :

[Total No. of Pages : 2

[5039]-42

M.Sc. Tech (Computer Science)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 402 : Computer Networks

(2008 Pattern) (Semester - IV)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***Neat diagram must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the followings: **[8 x 2= 16]**

a) Define the following terms with suitable diagram

i) Analog signals

ii) Digital signals

b) Discuss the functions of session layer.

c) Write about interfaces between the layers of ISO-OSI model.

d) Explain different fields of UDP header.

e) Discuss about remote bridges.

f) Show the Manchester and RZ line encoding scheme for the bit pattern 11100111001.

g) Draw the basic model of FTP.

h) Define the following terms:

i) Guided Media

ii) Unguided Media

i) What is the role of urgent pointer and window size of TCP segment header?

j) Draw the diagram of TCP/IP reference model.

P.T.O.

Q2) a) Attempt any one of the followings: **[1 × 6 = 6]**

i) Explain any two framing methods.

ii) Compare virtual circuit versus datagram services.

b) Attempt any two of the followings: **[2 × 5 = 10]**

i) Compare circuit switching versus packet switching.

ii) Write a note on multiplexing at transport layer.

iii) Explain various method of HTTP.

Q3) a) Attempt any one of the followings: **[1 × 6 = 6]**

i) Write a note on 1-persistent, non-persistent and P-persistent CSMA methods.

ii) Write a note on TelNET.

b) Attempt any two of the followings: **[2 × 5 = 10]**

i) Write a note on shortest path routing.

ii) Explain different station types in IEEE802.11.

iii) Explain one-bit sliding window protocol.

Q4) a) Attempt any one of the followings: **[1 × 6 = 6]**

i) Write a note on spanning tree bridges.

ii) Explain piconet and scatternet in Bluetooth.

b) Attempt any two of the followings: **[2 × 5 = 10]**

i) Explain static channel allocation in LANs.

ii) Write a note on stop and wait protocol.

iii) Explain any five fields of lP header.

Q5) a) Attempt any one of the followings: **[1 × 6 = 6]**

i) Write a note on transparent bridges.

ii) Explain BSS and ESS in Bluetooth.

b) Attempt any two of the followings: **[2 × 5 = 10]**

i) Explain dynamic channel allocation in LANs.

ii) Write a note on sliding window protocol.

iii) Explain any five flags of TCP segment header.

Total No. of Questions : 5]

P4103

SEAT No. :

[Total No. of Pages : 2

[5039]-43
M.Sc. Tech. (Sem - IV)
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 403 : Web Technology
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following: **[16]**

a) What is use of primitive data types? List primitive types of JavaScript.

b) What is XML namespace? What is its format?

c) Give general format for URL.

d) What are the attributes of the <tr> tag?

e) How Java scripts are embedded in HTML files?

f) What is XML? Write the general format of XML document?

g) List 2 sting operators used in Perl.

h) How the data specified in a form can be sent to the CGI program?

i) "PHP is dynamically typed". Justify whether True of False

j) List any two methods that are used in Http servlet class.

Q2) Solve any four of the following: **[4 × 4 = 16]**

a) Differentiate between Java and JavaScript.

b) Explain any four sorting functions for associative arrays of PHP.

c) Write short note on web servers.

d) Write a Perl program for accepting a filename as command line argument and convert the contents of the file in uppercase.

e) Explain concept of definition list with suitable example.

P.T.O.

Q3) Solve any four of the following: **[4 × 4 = 16]**

a) What are actual and formal parameters? Explain how JavaScript uses the pass-by-value parameter passing method with suitable method.

b) What is a variable? Explain different types of variables in PHP.

c) What is reference and dereference in Perl? Explain with suitable example the referencing & dereferencing in Perl.

d) Explain about set Cookie ()with syntax and suitable examples.

e) Explain any two loop constructs provided by JavaScript with example.

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Write a simple servlet to illustrate a GET request.

b) Create XML document for storing student details as:- name, address (city, pin), class, age

c) Explain any four character entities of HTML

d) What is query string? Describe format of a query string.

e) Create a HTML page that displays the following:

- Define the frameset document main.html.
- In left frame, fruits. Html document is loaded which contains 2 links apple and grapes each of which when clicked, the respective file opens in the frame named right.

Q5) Attempt any four of the following: **[4 x 4 = 16]**

a) Explain XSLT processing with suitable diagram.

b) Explain Response phase of HTTP protocol.

c) Explain different popup boxes that are supported by JavaScript with suitable examples.

d) Write a program in PHP to calculate factorial of a given number.

e) Explain any four predefined character classes of JavaScript.

Total No. of Questions : 5]

P4104

SEAT No. :

[Total No. of Pages : 3

[5039]-44
M.Sc. Tech.
INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS
MIM - 404 : Design and Analysis of Algorithms
(2008 Pattern)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***

Q1) Attempt any eight of the following: **[8 × 2 = 16]**

a) Define articulation point & bridge edge.

b) Explain the term 'Heap property'.

c) Show that $7n^2 + 2n$ is $O(n^2)$.

d) Describe 'fractional knapsack problem'.

e) Define NP Complete Problem.

f) Define O and Ω notation.

g) Explain the two components of space complexity.

h) Define : Transitive closure of a graph.

i) What is best case and worst case time complexity for quick sort algorithm?

j) Explain greedy strategy.

Q2) Attempt any two of the following: **[2 × 8 = 16]**

a) State Master's theorem. Solve the following recurrence relations using Master's theorem.

i) $T(n)=9T(n/3)+ n^2$

ii) $T(n)=7T(n/2)+ n^2$

b) What is multi-pop operation? What is its complexity? Explain the accounting method of amortized analysis and illustrate it on data structure stack with push, pop and multi-pop operations.

c) What is a heap? Explain how 'Heapify" algorithm is used to maintain heap property. What is its time complexity? Explain how 'heapify' is used in building the initial heap from an array.

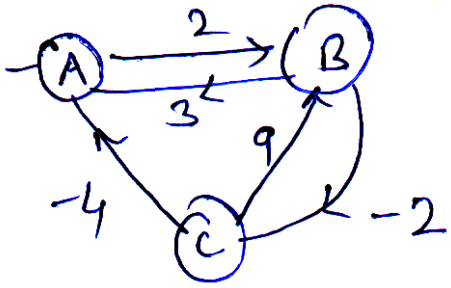
P.T.O.

Q3) Attempt any two of the following: **[2 × 8 = 16]**

a) Consider the travelling salesperson problem instance defined by following cost matrix. Find the tour of minimum cost.

$$\begin{bmatrix} \infty & 7 & 3 & 12 & 8 \\ 3 & \infty & 6 & 14 & 9 \\ 5 & 8 & \infty & 6 & 18 \\ 9 & 3 & 5 & \infty & 11 \\ 18 & 14 & 9 & 8 & \infty \end{bmatrix}$$

b) Discuss Floyd-Warshall algorithm for all pairs shortest path for a given weighted directed graph G = (V, E) with n vertices.



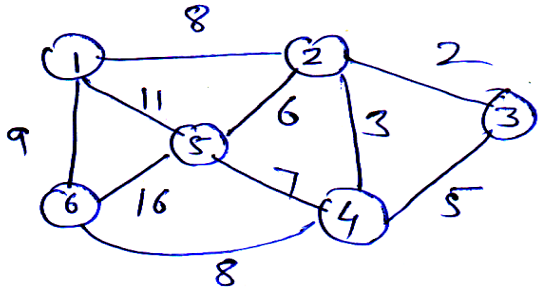
c) What is vertex cover problem? Prove that the vertex-cover problem is NP-complete.

Q4) Attempt any four of the following: **[4 × 4 = 16]**

a) Explain activity selection problem. Also Illustrate it using greedy strategy.

b) Merge sort the array a[l : 10] = (31, 28, 17, 65, 35, 43, 81,54,50, 20).

c) Using prim's algorithm find minimum spanning tree for the following graph.



d) Explain Bellman Ford algorithm for solving single source shortest path problem.

e) Explain how dynamic programming is used to solve the longest common subsequence problem.

Q5) Attempt any four of the following: **[4 × 4 = 16]**

a) What is an optimal Huffman coding for the following set of frequencies a:70, b:20, c:l0, d:120, e:5.

b) Explain counting sort algorithm. What is its time complexity?

c) Explain topological sort algorithm.

d) Write a note an NP-Completeness.

e) Rank the following functions in their increasing order of growth rates. The functions are n^n,n!, $\log_e n^n$, n^2 and e^n.

Total No. of Questions : 5]

SEAT No. :

P3128

[Total No. of Pages : 6

[5039]-51

M.Sc. (Tech.)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM-501: Operations Research and Optimizing Techniques

(2008 Pattern) (Semester-V)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the condidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non- Programmable scientific calculator is allowed.***
4) ***Graph papers will be supplied on demand.***

Q1) Attempt any EIGHT of the following. **[8×2=16]**

a) Write the following LPP in standard form:

Max $Z = x_1 + x_2$

Subject to,

$x_1 + 4x_2 \leq 5$

$x_1 - 2x_2 \leq 3$

$x_1, x_2 \geq 0.$

b) Explain the following for a LPP:

i) Slack variable

ii) Surplus variable

c) Define a transportation problem.

d) Define

i) Saddle point

ii) Pure strategy

P.T.O.

e) Show the feasible region for the following constraints of a LLP graphically:

$x + y \leq 6$

$x \leq 3$

$x, y \geq 0$

f) Obtain an IBFS for the following transportation problem by north-west corner method:

	D1	D2	D3	Availability
O1	23	17	16	30
O2	12	17	20	30
O3	22	28	12	20
Requirement	20	35	25	

g) What is an unbalanced assignment probelm? How to balance it?

h) Solve the following game by algebraic method:

		Player B	
		B_1	B_2
Player A	A_1	5	3
	A_2	1	4

i) Explain the term ‘ critical path’ of a network

j) What is sensitivity analysis?

Q2) Attempt any FOUR of the following. **[4×4=16]**

a) Solve the following LPP by graphical method:

Max $Z = 6x_1 + x_2$

Subject to $2x_1 + x_2 \leq 10$

$x_1 + 2x_2 \leq 6$

$x_1, x_2 \geq 0.$

b) Explain Big-M method for solving a LPP using a suitable example.

c) Write the dual of the following LPP:

Max $Z = x_1 + 2x_2 - x_3$

Subject to,

$$2x_1 - 3x_2 + 4x_3 \leq 5$$
$$2x_1 - 2x_2 \leq 6$$
$$3x_1 - x_3 \geq 4$$
$$x_1, x_2, x_3 \geq 0.$$

d) Explain the least cost method for obtaining an initial basic feasible solution of a transportation problem.

e) Solve the following assignment problem.

	I	II	III	IV
A	17	20	13	21
B	15	21	14	18
C	17	18	17	21
D	14	22	12	22

Q3) Attempt any FOUR of the following. **[4×4=16]**

a) A marketing manager wished to assign four zones Z_1, Z_2, Z_3 and Z_4 to four salesmen S_1, S_2, S_3 and S_4. The yield matrix is given below:

	Z_1	Z_2	Z_3	Z_4
S_1	7	12	37	18
S_2	25	27	18	25
S_3	16	13	17	23
S_4	10	25	14	9

Find the optimum assignment which maximizes the sales.

b) Explain the difference between a transportation problem and an assignment problem.

c) Reduce the following game by the dominance principle and find the optimum solution.

		Player B			
		I	II	III	IV
	I	8	10	9	14
player A	II	10	11	18	12
	III	13	14	14	14

d) Define the following for an activity of a PERT network:

i) Earliest start time

ii) Latest start time

e) Find IBFS of the following LPP.

Max $Z = 2x_1 + 3x_2$

Subject to,

$$x_1 + 2x_2 \leq 3$$
$$3x_1 + 4x_2 \leq 12$$
$$x_1 + x_2 \leq 10$$
$$x_1, x_2 \geq 0$$

is the solution optimum?

Q4) Attempt any Two of the following. **[2×8=16]**

a) Solve the following LPP by simplex method:

Max $Z = 3x_1 + 2x_2 + x_3$

Subject to,

$$-3x_1 + 2x_2 + 2x_3 \leq 8$$
$$-3x_1 + 4x_2 + x_3 \leq 7$$
$$x_1, x_2, x_3 \geq 0.$$

b) Find an initial solution of the following transportation problem by VAM and optimize it using MODI method:

	D_1	D_2	D_3	Capacity
O_1	13	15	16	17
O_2	7	11	2	12
O_3	19	20	9	16
Requirement	14	8	23	

c) i) Explain the Hungarian technique of an assignment problem.

ii) Explain maxmin and minimax principles of game theory.

Q5) Attempt any TWO of the following. **[2×8=16]**

a) Solve the following game using graphical method:

		PlayerB		
		I	II	III
PlayerA	I	2	-2	3
	II	3	5	-1

b) The following table gives the activities involved in a project and their duration:

	Estimated duration (in weeks)		
Activity	Optimistic	Most Likely	Pessimistic
1-2	1	1	7
1-3	1	4	7
1-4	2	2	8
2-5	1	1	1
3-5	2	5	14
4-6	2	5	8
5-6	3	6	15

i) Draw the project network.

ii) Find the expected duration and variance of each activity.

c) Write the dual of the following LPP. Solve the dual using graphical method

Max $Z = 6x_1+4x_2+5x_3$

Subject to,

$$2x_1 + x_2 + x_3 \leq 2$$
$$x_1 + 2x_2 + x_3 \leq 3$$
$$x_1, x_2, x_3 \geq 0.$$

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Total No. of Questions : 5]

SEAT No. :

P3129

[Total No. of Pages : 3

[5039]-52

M.Sc. (Tech.)

INDUSTRIAL MATHEMATICS WITH COMPUTERAPPLICATIONS

MIM-502: Numerical and Statistical Methods

(2008 Pattern) (Semester-V)

Time : 3 Hours] *[Max. Marks : 80*

Instruction:

1) *All questions are compulsory.*
2) *Figures to the right indicate full marks.*
3) *Use of non-programmable scientific calculator is allowed.*

Q1) Attempt any EIGHT of the following. **[8×2=16]**

a) Describe a sample space for the following experiment:

A two digit number is formed using the digits 2,5,6,8 using each digit only once.

b) Define each of the following:

i) Impossible event

ii) Sure event

c) Let A and B be two events defined on Ω such that P(A)=0.9,P(B)=0.5,P(A$\cup$B)=0.7. Find P(A$\cap$B)and P (A$\cap$B').

d) Define conditional probability of an event.

e) Determine k such that the following function represents probability mass function of X: $f(x) = kx, x = 1,2,...10.$

f) State the p.m.f. of Poisson distribution with parameter λ .Also state its mean.

g) Define distribution function of a continuous random variable.

h) State the probability density function of an exponential random variable with mean θ .State its variance.

i) Define karl Pearson's coefficient of correlation 'r'. State the limits of r.

j) State the equations of the regression lines.

P.T.O.

Q2) Attempt any FOUR of the following. **[4×4=16]**

a) Three coins are tossed together.The events are defined as below:

A:Exactly 2 coins show heads. B: At least one coin shows a tail.

Write the elements of A and B. Are they mutually exclusive?

b) Give classical definition of probability. Also state its limitations.

c) Explain the following terms:

i) A discrete random variable

ii) Probability distribution of a discrete random variable.

d) Let X be a continuous random variable with p.d.f

$f(x) = 3x^2 \qquad 0 \le x \le 1$

$=0 \qquad$ *otherwise*

find E(X).

e) Let a discrete random variable X has Poisson distribution with λ=1.5.

Find i) P(X>2) ii) P (3<X<6)

Q3) Attempt any four of the following. **[4×4=16]**

a) State the p.m.f. of Binomial distribution with parameters n and p. State its mean and variance. Also state additive property of Binomial distrubution.

b) Define Normal distribution with parameters μ and σ2.State any three important properties of Normal distribution.

c) Suppose that the duration of a phone call in minutes is an exponential random variable with mean 10 . If someone arrives just before you at a telephone booth, find the probability that you will have to wait:

i) More than 10 minutes

ii) Between 10 and 20 minutes.

d) Let X be a normal random varible with parameters μ=3 and σ^2=9. Find

i) $P(2<x<5)$

ii) $P(x>0)$

e) Let X has Uniform distribution over (-3, 3). Write the probability density function of X. Also find distribution function of X.

Q4) Attempt any FOUR of the following. **[4×4=16]**

a) Find the correlation coefficient between X and Y given that, n=25,

$\Sigma X = 75, \Sigma Y = 100, \Sigma x^2 = 250, \Sigma Y^2 = 500, \Sigma XY = 325$

b) Write a note on scatter diagram.

c) Given,

$\overline{x} = 53, \overline{y} = 28, byx = -1.5, bxy = -0.2$ find the equations of the two lines of regression.

d) For a trivariate data state the equation of multiple regression plane of X_1 on X_2 and X_3.Also state the formulae of partial regression coefficients involved in it.

e) Explain the test procedure for testing $H_0: \mu = \mu_0$ against $H_1: \mu > \mu_0$ for a large sample at α% level of significance.

Q5) Attempt any FOUR of the following. **[4×4=16]**

a) The regression equation of Y on X is given by 8X-10Y+66=0.

i) Find regression coefficient *byx*

ii) If $\overline{x}$ =13, find $\overline{y}$.

b) For a trivariate data r_{12}= 0.7,r_{13} = r_{23} = 0.5. Find $r_{12.3}$ and $R_{1.23}$.

c) Explain the test procedure for testing independence of attributes in a 2 X 2 contingency table.

d) Out of 1000 residents in a certain area 350 were found to be earthquake affected. Can we accept the claim that there are less than 40% earthquake affected residents? Use α=0.05.

e) Write a note on Analysis of Variance.

❖ ❖ ❖

Total No. of Questions :5]

SEAT No. :

P3130

[Total No. of Pages :5

[5039] - 53

M.Sc. (Tech.)

INDUSTRIAL MATHEMATICS WITH COMPUTER APPLICATIONS

MIM - 503: Digital Image Processing

(2008 Pattern) (Semester - V)

Time : 3 Hours] *[Max. Marks :80*

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non-programmable scientific calculator is allowed.***

Q1) Attempt ANY EIGHT OF the following: **[8×2=16]**

a) Define the following terms:

i) Luminance

ii) Rediance.

b) Justify the following statement:

'Quality of the picture depends on the number of pixels and number of gray levels that represents the picture.

c) Define: Pepper and salt noise

d) State : Shifting property of unit impulse.

e) Define: City block distance.

f) Explain in short 'Threshold'.

g) Define: Connected component of an image.

h) What is JPEG and TIFF?

i) Explain in short 'Contrast Stretching'.

j) Explain the terms area and perimeter as a regional descriptors.

P.T.O.

Q2) Attempt ANY FOUR of the following: **[4×4=16]**

a) Explain with suitable diagram, any one type of image acquisition technique.

b) Check whether the following regions

S_1 and S_2 are:

i) 4 - connected

ii) 8 - connected.

0	0	0	0	0	0	0	1	1	0
1	0	0	1	0	0	1	0	0	1
1	0	0	1	0	1	1	0	0	0
0	0	1	1	1	0	0	0	0	1
0	0	1	0	1	1	0	1	1	0
		S_1					S_2		

c) Write a note on components of an image processing system.

d) Obtain a result of convolution and correlation of image '*f*' with mask '*w*'.

f : 0 0 0 1 0 0

w : 5 3 2 1 2

e) For a 3 – bit image (L = 8) of size 64 × 64 pixels, has intensity distribution shown in the following table, where the intensity levels are integers in the range (0, 7). Draw histogram for the same image.

r_k = Intensity

n_k = No. of pixels with intensity r_k.

$$P_r(r_k) = \frac{n_k}{M \cdot N}$$

r_k	n_k	$P_r(r_k)$
$r_0 = 0$	790	0.91
$r_1 = 1$	1023	0.25
$r_2 = 2$	850	0.21
$r_3 = 3$	656	0.16
$r_4 = 4$	329	0.08
$r_5 = 5$	245	0.06
$r_6 = 6$	122	0.03
$r_7 = 7$	81	0.02

Q3) Attempt ANY FOUR of the following: **[4×4=16]**

a) Explain smoothing of image using spatial filters in detail.

b) Explain the use of image processing in fingure print identification.

c) Consider the image segment shown:

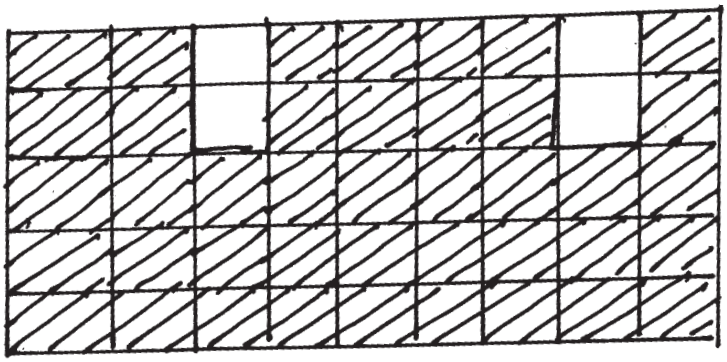
Let V = {2, 3, 4}.

Compute the length of a shortest path 8 – path, *m* - path between the pixels '*p*' and '*q*'. If a perticular path does not exist between these pixels then explain why.

	3	4	1	2	0	
	0	1	0	4	2	$= q$
	2	2	3	1	4	
$p =$	3	0	4	2	1	
	1	2	0	3	4	

d) With the help of suitable masks, explain line detection.

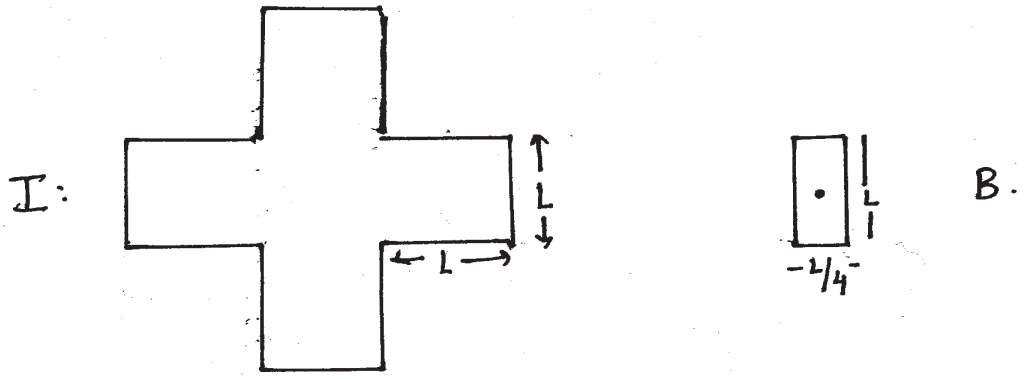
e) Use boundary extraction algorithm in morphology to extract boundary of the following image.



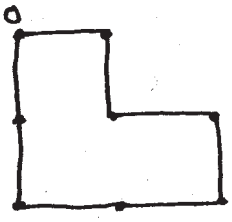
Q4) Attempt ANY FOUR of the following: **[4×4=16]**

a) Discuss the RGB model for colour images.

b) Apply Erosion on image I with structuring element B.



c) Define shape number and find shape number of the following image.



d) Use mean filter to smooth the following image.

I

0	1	1
1	1	2
0	0	1

e) Why do we process images? Explain with suitable examples.

Q5) Attempt ANY TWO of the following: **[2×8=16]**

a) With the help of neat diagram, illustrate and explain various steps in image processing.

b) Apply Moore's algorithm to extract boundary of the following image.

		1	1	1	1	
	1					1
		1			1	
	1				1	
	1	1	1	1	1	

c) Define and find:

i) First derivative of digital image 'I'.

ii) Second derivative of digital image 'I'

Where I is one dimensional image.

I :	6	6	6	6	5	4	3	2	1	1	1	6	6	6	6

Total No. of Questions : 5]

SEAT No. :

P3131

[Total No. of Pages : 2

[5039]-54
M.Sc. (Tech.)
COMPUTER SCIENCE
Industrial Mathematics with Computer Applications
MIM-504: Advanced Operating Systems
(2008 Pattern) (Semester-V)

Time : 3 Hours] *[Max. Marks : 80*

Instructions to the condidates:

1) ***All questions are compulsory.***
2) ***Figures to the right indicates full marks.***

Q1) Attempt any Eight of the following: **[8×2=16]**

a) Discuss any two fields of File System Layout.

b) What is the role of free list and hash queue of buffers?

c) State the role of function parameter used in signal system call.

d) Write in short about the concept of map.

e) Explain any two options of chkconfig command.

f) What do you mean by real user ID and effective user ID?

g) Write a note on regions.

h) Draw state diagram of page aging.

i) State and explain the fork() system call.

j) Discuss the use and syntax of setuid system call.

Q2) a) Attempt any one of the following. **[1×6=6]**

i) Write a note on init process.

ii) Discuss various components of register context.

b) Attempt any two of the following. **[2×5=10]**

i) State and explain various fields of u- area.

ii) Write a note on shell.

iii) Explain the structure of buffer header.

P.T.O.

Q3) a) Attempt <u>any one</u> of the following: **[1×6=6]**

i) Write a note on page stealer process.

ii) Explain with suitable diagram socket layer, protocol layer and device layer.

b) Attempt <u>any two</u> of the following: **[2×5=10]**

i) How kernel handles the operating system trap.

ii) Write a note on system boot.

iii) How process will respond if the signal is "death of child"?

Q4) a) Attempt <u>any one</u> of the following: **[1×6=6]**

i) What is RPM? Also explain the various options of rpm command.

ii) Explain different states during page fault.

b) Attempt <u>any two</u> of the following: **[2×5=10]**

i) State the several drawbacks during the use of ptrace for process tracing.

ii) When kernel permits a context switch? State various steps for a context switch.

c) State the role of following bit fields to support demand paging:

i) Valid

ii) Reference

iii) Modify

iv) Copy on Write

v) Age

Q5) a) Attempt <u>any one</u> of the following: **[1×6=6]**

i) Explain advantages and disadvantages of the buffer cache.

ii) With suitable diagram discuss the several parts of an executable file

b) Attempt <u>any two</u> of the following: **[2×5=10]**

i) Write a note on attaching a region.

ii) Explain the concept of status of a buffer.

iii) State the various cases in which the kernel removes the entries for sticky bit text regions.

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