

Total No. of Questions : 5]

SEAT No. :

P865

[Total No. of Pages : 3

[4140] - 103

M.C.A. (Science Faculty)

CS. 103 : MATHEMATICAL FOUNDATION

(2008 Pattern) (Sem. I)

Time : 3 Hours]

[Max. Marks : 80

Instructions :-

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

Q1) Attempt any four of the following.

[16]

- a) Define following terms with proper example.
 - i) Relation.
 - ii) Function.
 - iii) Binary relation.
 - iv) Bijective function.
- b) For any three sets A, B and C, prove that.
$$A \cup (B \cap C) = (A \cup B) \cap (A \cup C).$$
- c) Let L is set of all lines in a plane. Define binary relation $R : L \rightarrow L$ as $l_1 R l_2$ if and only if l_1 is parallel to l_2 , for l_1 and $l_2 \in L$. Then prove that R is equivalence relation. Also find equivalence class of line $Y = 2x$.
- d) If A is set of all integers and B is set of all even integers then.
find. i) $A \cup B$
ii) $A \cap B$
iii) $A - B$
iv) $(A \cup B) - (A \cap B)$
- e) If $A = \{x/ x^2 + 2x + 1 = 0\}$ and
 $B = \{x/ (x+1)(x+2)(x-1) = 0\}$
Then find $A \times B$ and $B \times A$.

P.T.O.

Q2) Attempt any four of the following.

[16]

- a) Determine truth value of the following composite statement.
 - i) It is not true that $1+1 = 3$ or $2+1 = 3$.
 - ii) If n is odd integer then n^2 is even integer
 - iii) Mumbai is capital of Maharashtra or Delhi is Capital of India.
 - iv) There does not exist 3 mutual perpendicular lines in plane.
- b) Determine whether the proposition $[(p \wedge q) \rightarrow r] \rightarrow [p \rightarrow (q \rightarrow r)]$. is a tautology, contradiction or contingent.
- c) Prove or disprove the following equivalence.
$$P \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r).$$
- d) Test validity of following argument without using truth table.
$$p \rightarrow q, (\sim p \wedge r) \rightarrow s, \sim q \vdash (r \rightarrow s).$$
- e) Using indirect method of proof. prove that \sqrt{P} is irrational number, where P is prime number.

Q3) Attempt any four of the following.

[16]

- a) Check whether $G = \{1, -1, i, -i\}$ is a group with respect to usual multiplication.
- b) Let $G = \left\{ \begin{bmatrix} a & b \\ c & d \end{bmatrix} / a, b, c, d \in \mathbb{Z} \right\}$. $*$ is usual matrix addition check whether.
 - i) $(G, *)$ is monoid.
 - ii) $(G, *)$ is Semigroup.
 - iii) $(G, *)$ is group
 - iv) $(G, *)$ is abelian group.
- c) Let $(G, *)$ is group then prove that $(a * b)^{-1} = b^{-1} * a^{-1}$. $\forall a, b \in G$.
- d) Prove that intersection of two subgroups H_1 and H_2 of a group G is also subgroup of G .
- e) Prove that every permutation is a product of its cycles.

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

- a) Find g. c. d. of $f(x) = x^3 - x^2 + x - 1$ and $g(x) = x^2 - 1$.
- b) Prove that there are infinitely many pairs of x and y satisfying g. c. d. $(x, y) = 5$ and $x + y = 100$.
- c) Find g. c. d. of 3927 and 377. Also find x and y so that $(3927, 377) = x(3927) + y(377)$.
- d) If $a \equiv b \pmod{n}$ and $c \equiv d \pmod{n}$. Then prove that.
 - i) $a + c \equiv b + d \pmod{n}$.
 - ii) $a \cdot c \equiv b \cdot d \pmod{n}$.
- e) Find remainder after dividing to $4^{37} + 82$ by 7.

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

- a) If $6 = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 5 & 6 & 7 & 8 & 9 & 1 & 2 & 3 & 4 \end{pmatrix}$ then find τ so that $6\tau = \tau 6 = I$ where I is identity permutation.
- b) Solve following system of linear equations.
$$\begin{aligned}x + y + z &= 3 \\2x - y + 3z &= 4 \\2x - y - z &= 0.\end{aligned}$$
- c) Factorise the following polynomial.
$$x^4 - 6x^3 + 11x^2 - 6x.$$
- d) Write the truth set of the following predicates. If the universe of discourse is $U = \{1, 2, 3, 4, 5\}$
 - i) $(\exists x), (x^2 - 3x + 2 = 0)$
 - ii) $(\forall x), (x^2 \geq 9)$
 - iii) $(\forall x), (x \text{ is prime integer}).$
 - iv) $(\exists x), (x \text{ is divisor of } 13)$
- e) find inverse of following matrix A by adjoint method.

$$\text{Where } A = \begin{bmatrix} 2 & 3 & 4 \\ 2 & 1 & 1 \\ -1 & 1 & 2 \end{bmatrix}.$$



Total No. of Questions : 5]

SEAT No. :

P868

[Total No. of Pages : 4

[4140] - 202

**M.C.A. Science Faculty
COMPUTER SCIENCE**

**CS - 202 : Theoretical Computer Science
(2008 Pattern) (Sem. - II)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of following

[8 × 2 = 16]

- a) List any four properties of sets.
- b) Define Suffix and list all proper suffixes for string "abcd".
- c) Define tuples for DFA and write the condition for string acceptance in FA.
- d) Describe the language in English and give the language set for the following regular expression.
 $a(a + b)^* b + b(a + b)^* a$
- e) Define Nullable Symbol and give one example.
- f) Write a language for CFG $S \rightarrow aSb \mid bSa \mid \epsilon$ and define the set for the language.
- g) Prove that the relation "=" is equivalence relation on set S.
- h) Define Halting Problem of Turing Machine. Represent the halting set.

Q2) Attempt any 4 of following:

[4 × 4 = 16]

- a) Construct the DFA to accept all decimal numbers divisible by 3.

P.T.O.

b) Convert the following Moore machine equivalent to Melay machine

State	δ		λ
	a	b	
q_0	q_1	q_2	0
q_1	q_1	q_1	1
q_2	q_1	q_0	0

c) Construct the CFG for the following languages

i) $L = a^*b^*$

ii) $L = ab^*$

iii) $L = (baa + abb)^*$

iv) $L = \{a^n b^m c^n \mid n \geq 0, m > 0\}$

d) Write a short note on Chomsky hierarchy of languages.

e) Convert the following DFA to its equivalent NFA where

$$M = (\{q_0, q_1, q_2, q_3\}, \{0, 1, 2\}, \delta, q_0, \{q_2, q_3\})$$

State	δ		
	0	1	2
q_0	$\{q_0, q_3\}$	$\{q_1, q_3\}$	q_0
q_1	$\{q_1, q_3\}$	$\{q_2, q_3\}$	q_2
q_2	$\{q_2, q_3\}$	$\{q_2, q_3\}$	ϕ
q_3	ϕ	ϕ	ϕ

Q3) Attempt any 4 of following.

[4 × 4 = 16]

a) Convert the following CFG, $G = (\{S, A, B\}, \{a, b\}, P, S)$ to its equivalent CNF-P : $S \rightarrow aAab \mid Aba$

$$A \rightarrow aS \mid bB$$

$$B \rightarrow ASb \mid a$$

b) Construct the PDA to accept well formedness of parenthesis over $(\{ (, (,],) \})^*$

c) Convert the following NFA with ϵ – transition to equivalent DAF where $M = (\{q_0, q_1, q_2, q_3, q_4, q_5\}, \{0, 1\}, \delta, q_0, \{q_5\})$

δ :

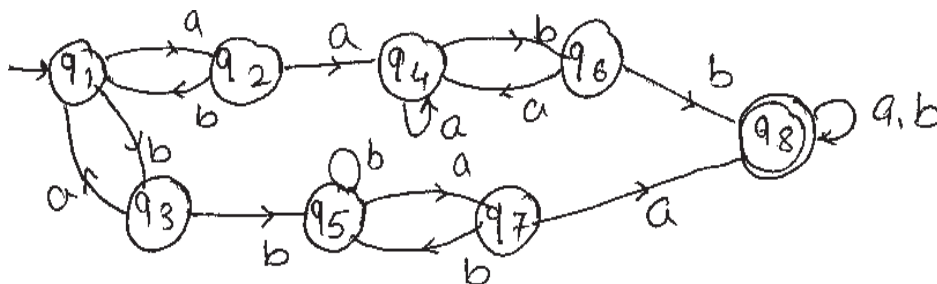
State	δ	
	0	1
q_0	ϕ	ϕ
q_1	q_2	ϕ
q_2	ϕ	q_3
q_3	ϕ	ϕ
q_4	ϕ	q_5
q_5	ϕ	ϕ

- d) Construct the Moore machine to give output A if the string ends in 'pqr', 'B' if string ends in 'prp', otherwise output will be C.
- e) Construct NFA for the regular language $(a + b^*)^* + a^* bb^*$

Q4) Attempt any 4 of following:

[4 × 4 = 16]

- a) Prove that the regular languages are closed under Homomorphism.
- b) Construct the Turing machine which will replace every occurrence of a substring 11 if any, by keeping everything else intact over $\{0,1\}$
- c) Convert the following CFG $G = (\{S,A,B,C\}, \{a, b\}, P, S)$ to equivalent GNF
 $P : S \rightarrow ABC$
 $A \rightarrow a \mid b$
 $B \rightarrow Bb \mid aa$
 $C \rightarrow aC \mid cC \mid ba$
- d) Convert the following CFG $G = (\{S,A,B\}, \{0, 1\}, P, S)$ to equivalent PDA
 $P : S \rightarrow 0A1$
 $A \rightarrow 0A1 \mid B$
 $B \rightarrow 1B \mid 1$
- e) Prove that the following DFA can not be minimized.



Q5) Attempt any 4 of following:

[4 × 4 = 16]

- a) Prove that the language $L = \{a^n b^n \mid n \geq 1\}$ is not regular using pumping lemma.
- b) Prove that the CFS are closed under concatenation.
- c) Construct the Turing machine to multiply two unary numbers.
- d) Describe the language represented by following regular expressions
 - i) $R = (0+1)^*0$
 - ii) $R = (1+01)^*(0+01)^*$
- e) Convert the following PDA to its equivalent CFG

$M = (\{q_0, q_1\}, \{a, b\}, \{Z_0, Z_1\}, \delta, q_0, Z_0, \phi)$

δ : $\delta(q_0, b, Z_0) \rightarrow (q_0, ZZ_0)$ $\delta(q_0, b, Z) \rightarrow (q_0, ZZ)$
 $\delta(q_0, \epsilon, Z_0) \rightarrow (q_0, \epsilon)$ $\delta(q_0, a, Z) \rightarrow (q_1, Z)$
 $\delta(q_1, a, Z_0) \rightarrow (q_0, Z_0)$ $\delta(q_1, b, Z) \rightarrow (q_1, \epsilon)$



Total No. of Questions : 5]

SEAT No. :

P863

[Total No. of Pages : 3

[4140] - 101
M.C.A. - I (Under Science Faculty)
CS - 101 : 'C' Programming
(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Figures to the right indicate full marks.*
- 2) *All questions carry equal marks.*
- 3) *All questions are compulsory.*
- 4) *Assume suitable data, if necessary.*

Q1) a) Trace the out put. (any two) :

[2 × 4 = 8]

```
i) main ( )
   {   int x, y;
       scan f(f %d", &x);
       y = (x75? 3 : 4);
   }

ii) main ( )
   {   int a = 30;
       fun (a)
       print f (" 1n %d", a);
   }
   fun (int b)
   {
       b = 60;
       print f ("1n%d", b);
   }

iii) main ( )
   {   int i, j;
       for (i = 1, i <= 2; i++)
       {   for (j = 1; j <= 2; j++)
           {   if (i == j)
               print f("1n%d % d 1n", i, j);
           }
       }
   }
```

P.T.O.

b) Find out the error and explain. (any two)

[2 × 4 = 8]

```
i) main ( )
    {   Struct employee
        {   Char name [25];
            int age;
            float bs;
        };
        struct employee e;
        strcpy (e.name, "Ganesh");
        age = 25;
        print f("1n%s %d", e.name, age);
    }

ii) main ( )
    {   int suite = 1;
        switch (suite);
        {   case 0;
            print f("1n club");
            case 1;
            print f("1n Diamond");
        }
    }

iii) main ( )
    {   int i = 2;
        # def DEF
        i * = i;
        # else
        print f("1n%f ", i);
        # end if;
    }
```

Q2) Attempt any four of the following :

[4 × 4 = 16]

- Compare if and switch statement with example.
- What is recursion? Explain with suitable example.
- Explain any five string manipulation functions with suitable examples.
- Give advantages & disadvantages of array.
- Explain in detail any four datatypes used in 'C' language.

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

- a) Write a function which accepts a string and check whether it is a palindrome or not.
- b) Write a function to calculate m^n .
- c) Write a 'C' program to accept a decimal number & convert it into binary equivalent.
- d) Write a 'C' program to define 3×3 matrix and print sum of diagonal elements.
- e) Write a 'C' program to display first 'n' even numbers.

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

- a) What are the limitations of array of pointers to strings?
- b) Explain malloc () with suitable examples.
- c) Write a note on conditional compilation.
- d) Write the use of gets () and puts () and explain its use.
- e) What are the advantages of dynamic memory allocation.

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

- a) Write a 'C' program to accept two strings from command prompt and print concatenation of two strings.
- b) Write a 'C' program lines from a file.
- c) Write a 'C' program to accept and display information of 'n' employee (empno, empname, salary) using structure.
- d) Write a 'C' program to count the number of words in a given text file.
- e) Write a menu driven program for following options
 - i) Read 1 string.
 - ii) Find the length of string.
 - iii) Reverse string.



Total No. of Questions : 5]

SEAT No. :

P864

[Total No. of Pages : 2

[4140] - 102

M.C.A. - I (Science Faculty)

CS - 102 : COMPUTER ARCHITECTURE

(2008 Pattern) (Sem. - I)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Draw neat diagrams wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt any four of the following :

[4 × 4 = 16]

- a) Draw symbol and write truth table of following gates :
 - i) AND
 - ii) OR
 - iii) NOT
 - iv) EXOR
- b) Write a short note on J.K Master Slave Flip Flop.
- c) Explain four segment instruction pipeline.
- d) Write a short note on USB standard.
- e) What is a multiplexer? Explain how many select lines are required to construct 32 : 1 MUX.

Q2) Attempt any two of the following :

[2 × 8 = 16]

- a)
 - i) Explain I/O interface with block diagram.
 - ii) Explain asynchronous data transfer using handshaking method.
- b) Draw diagram and explain working of 4 bit R-2R ladder Digital to Analog converter.
- c) Explain need of local bus and state features of PCI bus.

P.T.O.

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

- a)
 - i) State the enhanced features included in 80386 over 80286.
 - ii) State the enhanced features included in 80486 over 80386.
- b) What are parallel computer structures? Explain any one structure.
- c) Explain working of D-flip flop using R-S flip flop with logic diagram and truth table.
- d) Differentiate between the real mode and protected mode operation of microprocessor.
- e) What is interrupt?
Explain :
 - i) Hardware interrupts.
 - ii) Software interrupts.

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

- a) Compare ISA and EISA bus with respect to transfer rate and address lines.
- b) Draw internal structure of 80 × 87 arithmetic coprocessor. Write in brief about the control unit of the same.
- c) Draw diagram and explain working of a dual slope analog to digital converter.
- d) Differentiate between :
 - i) Serial communication and parallel communication.
 - ii) Synchronous and asynchronous communication.
- e) Draw logic diagram and explain working of half adder.

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

- a) State the components of a microprocessor. Explain function of each component.
- b) Draw diagram and explain DMA transfer in a computer system.
- c) Draw block diagram of 8255 and explain working of each block.



[4140] - 104
MCA - I (Under Science Faculty)
MATHEMATICS
CS - 105 : Graph Theory
(2008 Pattern) (Sem. - I)

Time : 3 Hours]

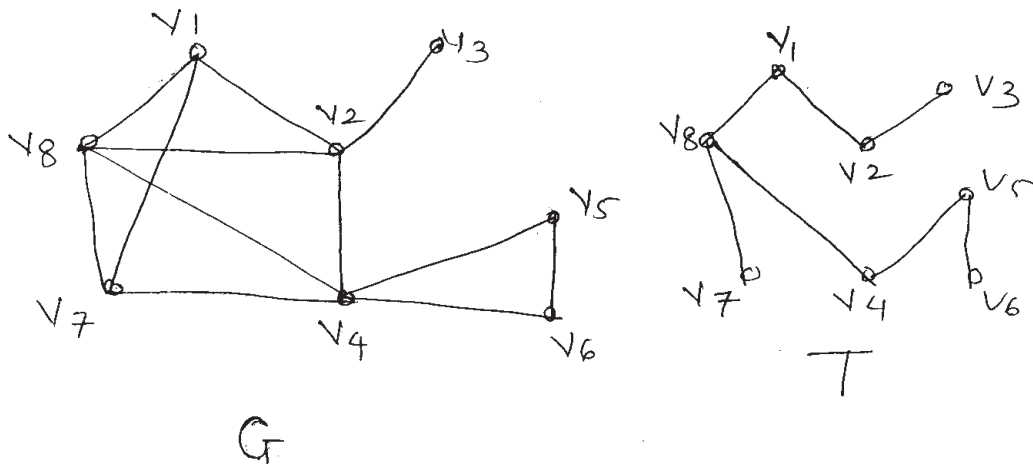
[Max. Marks : 80

Instructions to the candidates:

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

Q1) Attempt any four of the following : [16]

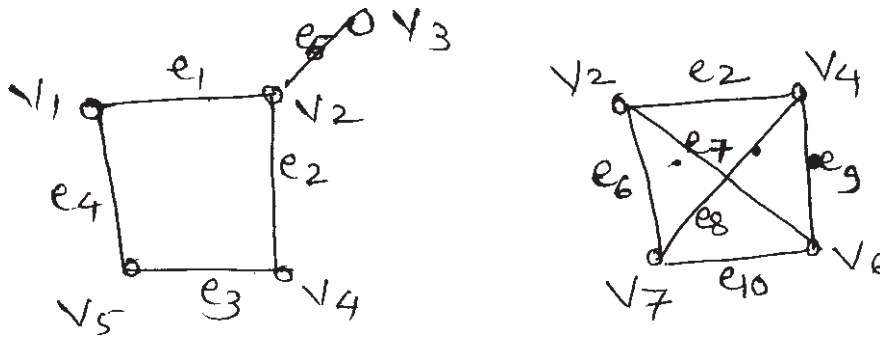
- a) If G is a 5-regular graph on n vertices then what is degree of any vertex in \bar{G} ?
- b) Draw the following graphs
 - i) A complete bipartite graph which is Eulerian.
 - ii) An Eulerian graph which is not Hamiltonian.
- c) Find all the fundamental cycles in G with respect to its spanning tree T .



- d) Draw the graph G having following incidence matrix and find its adjacency matrix.

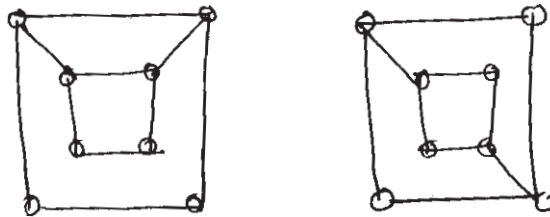
$$\begin{bmatrix} 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

- e) For the following graphs G_1 and G_2 , find $G_1 \cup G_2$ and $G_1 \cap G_2$.



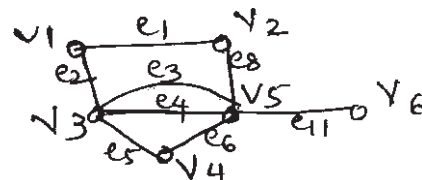
Q2) Attempt any four of the following : [16]

- Solve the following recurrence relation $a_n + a_{n-1} - 6a_{n-2} = 2 \cdot (4)^n$.
- Find the number of chords and branches of a spanning tree of K_n .
- If G is acyclic graph on n vertices having $(n - 1)$ edges then show that G is a tree.
- Define the following
 - Asymmetric digraph
 - Connected graph
- Show that the following pair of graphs is not isomorphic.



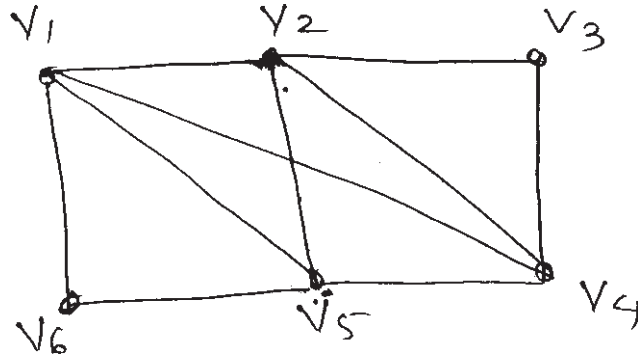
Q3) Attempt any four of the following : [16]

- If G is a self complementary graph on n vertices, then show that n is of the type $4k$ or $4k+1$ for some integer k .
- Let G be the graph given below.
 $U = \{v_2, v_3\}$, $F = \{e_1, e_2, e_8, e_{11}\}$. Find vertex deleted subgraph $G - U$ and edge deleted subgraph $G - F$



- If C is a cutset of a connected graph G then prove that C contains at least one branch of every spanning tree.

d) Using Fleury's algorithm find Eulerian trail in the following graph.



e) There are basic four blood types A, B, AB, and O. Type O can donate to any of the four types. A and B can donate to AB as well as their own types, but AB can only donate to AB. Draw a digraph, which presents this information.

Q4) Attempt any four of the following :

[16]

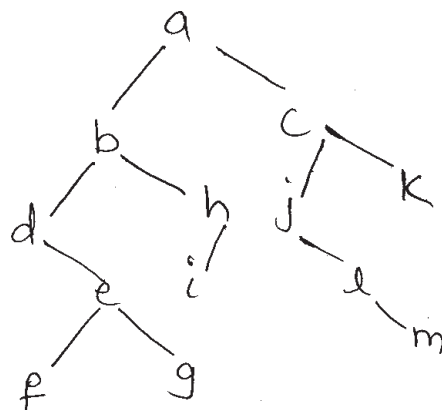
a) Draw the arborescence and express in polish notation.

$$\frac{x * y}{c - \frac{d^4}{3} + b} + e$$

b) Write Kruskal's algorithm to find minimal weight spanning tree.

c) Solve the recurrence relation $a_n + 5a_{n-1} + 8a_{n-2} + 4a_{n-3} = 0$

d) Obtain preorder and post order traversals for the following binary tree



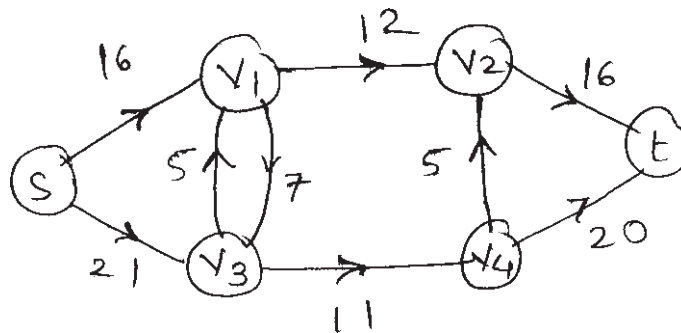
e) Define : Network,
Flow

State Max Flow-Min Cut theorem.

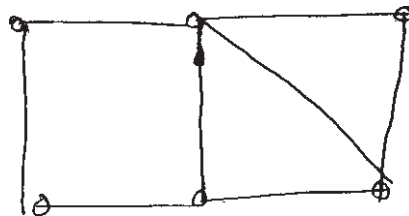
Q5) Attempt any four of the following :

[16]

- Draw all nonisomorphic labelled trees on 4 vertices.
- Determine the maximal flow in the given network, from source s to sink t.



- Find all the circuits in the given graph G and hence decide whether G is bipartite.



- Let G be connected graph on n vertices and m edges then show that

$$\lambda(G) \leq \left\lfloor \frac{2m}{n} \right\rfloor.$$

- Draw a graph in which every edge is a bridge.
 - Can you draw a graph in which every edge is a cut vertex? Justify.



Total No. of Questions : 5]

SEAT No. :

P867

[Total No. of Pages : 3

[4140] - 201

M.C.A. - I (Science Faculty)

CS - 201 : Data and File Structures Using 'C'

(2008 Pattern) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

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

Q1) Attempt any four of the following :

[4 × 4 = 16]

- a) What is abstract data type? Explain with example.
- b) Differentiate between static and dynamic memory allocation.
- c) What is recursion? Explain with example.
- d) Explain an adjacency list and inverse adjacency list of a graph with example.
- e) Write a function to delete a node from a singly circular linked list.

Q2) Attempt any four of the following :

[4 × 4 = 16]

- a) Write a function in 'C' to accept n numbers from user and create two separated linked list of positive and negative numbers.
- b) Apply Heap sort to the following data set :
98, 22, 79, 36, 47, 26, 82, 32
(Sort numbers in ascending order)
- c) Write a recursive function in 'C' to create a mirror image of a binary tree.
- d) Write a function in 'C' to check balance of paranthesis in an expression using stack.
- e) Explain different hashing functions (any 2).

P.T.O.

Q3) Attempt any four of the following :

[4 × 4 = 16]

- Write a function in 'C' to insert an element at given position in a doubly linked list.
- The following values are stored in a hash table :
13, 45, 24, 113, 161, 207, 211
Use division method of hashing with table size 11. Number of slot is 1 in each bucket. Apply linear probing method to resolve overflow. Show hash table contents
- How stack can be represented with linked list? Implement its primitive operations.
- Sort the following numbers using insertion sort. Show all steps in sorting (ascending order)
26, 75, 48, 73, 21, 86, 33, 29
- Consider the following adjacency matrix

$$\begin{array}{c} V_1 \quad V_2 \quad V_3 \quad V_4 \quad V_5 \\ \begin{array}{c} V_1 \\ V_2 \\ V_3 \\ V_4 \\ V_5 \end{array} \begin{bmatrix} 0 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

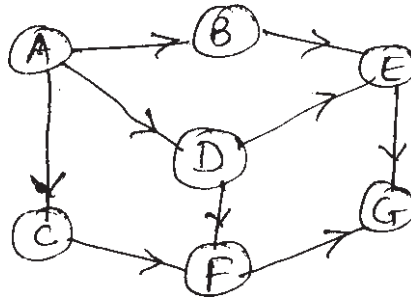
- Draw the graph from adjacency matrix.
- Find out an indegree and out degree of all vertices.

Q4) Attempt any four of the following :

[4 × 4 = 16]

- Construct an AVL tree for the following data : XYZ, PQR, LMN, QBC, ABC, STR, UVW, BMC.
- Write a short note on Priority Queue.
- Explain clustered and unclustered indexing.
- Write a function in 'C' to merge two sorted linked list into third list. Third linked list should also be in sorted order without repetition of data.

- e) Traverse the following graph using FS. Show all the steps (assume start vertex as A).



Q5) Attempt any four of the following :

[4 × 4 = 16]

- Write a function in 'C' to search an element in BST.
- Write a short note on ISAM.
- Write functions in 'C' to implement operations of a Circular Queue.
- What is generalized linked list? Represent the given list (a, (b, c, d), e, f).
- What are different applications of graph?



Total No. of Questions : 4]

SEAT No. :

P871

[Total No. of Pages : 4

[4140] - 301

MCA - II (Science Faculty)

COMPUTER SCIENCE

CS - 301 : Design and Analysis of Algorithms

(New Course) (Sem. - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.
- 2) Figures to the right indicate full marks.
- 3) All questions are compulsory.

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) List any four properties of sets.
- b) Define Suffix and list all proper suffixes for string “abcd”.
- c) Define tuples for DFA and write the condition for string acceptance in FA.
- d) Describe the language in English and give the language set for the following regular expression $a(a + b)^*b + b(a + b)^*a$
- e) Define Nullable Symbol and give one example.
- f) Write a language for CFG $S \rightarrow aSb \mid bSa \mid e$ and define the set for the language.
- g) Prove that the relation “=” is equivalence relation on set S.
- h) Define Halting Problem of Turing Machine. Represent the halting set.

Q2) Attempt any four of the following :

[4 × 4 = 16]

- a) Construct the DFA to accept all decimal numbers divisible by 3.
- b) Convert the following Moore machine equivalent to Melay machine.

State d l

a b

$q_0 \ q_1 \ q_2 \ 0$

$q_1 \ q_1 \ q_1 \ 1$

P.T.O.

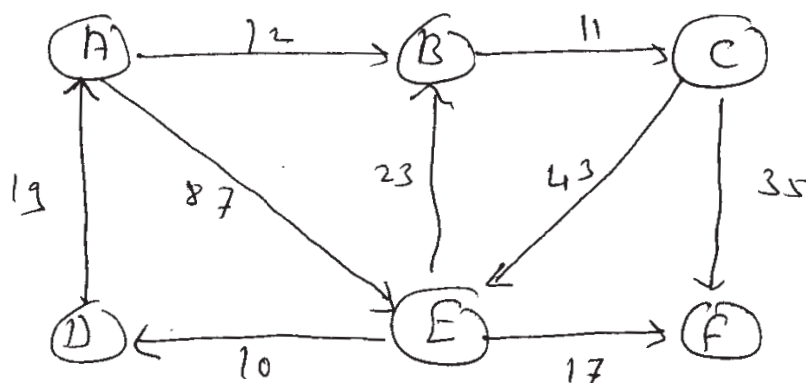
$q_2 q_1 q_0 1$

- c) Construct the CFG for the following languages
- i) $L = a^*b^*$
 - ii) $L = ab^*$
 - iii) $L = (baa + abb)^*$
 - iv) $L = \{a^n b^m c^n \mid n \geq 0, m > 0\}$
- d) Write a short note on Chomsky hierarchy of languages.
- e) Convert the following DFA to its equivalent NFA where $M = (\{q_0, q_1, q_2, q_3\}, \{0, 1, 2\}, d, q_0, \{q_2, q_3\})$

Q3) Attempt any four of the following :

[4 × 8 = 32]

- a) Solve the following instance of the single source shortest paths problem with vertex A as the source for the given graph using Dynamic programming. Also write the algorithm for the above problem.

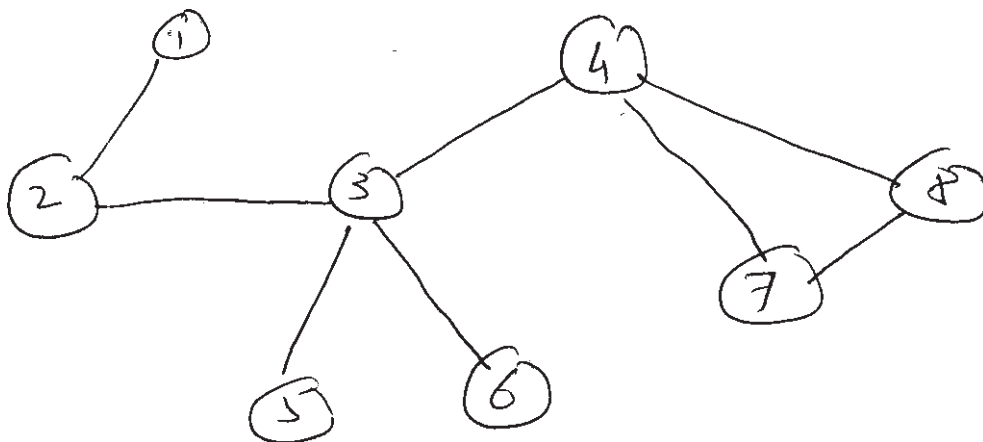


- b) Write an algorithm to implement merge sort. Give its recurrence relation and solve it to obtain the time complexity. Solve the following entries using an improved version of merge sort. 20, 35, 18, 8, 14, 41, 3, 39.
- c) Consider the following travelling salesman instance defined by cost

matrix. Obtain the reduced cost matrix. Draw state space tree using LCBB.

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

- d) Let $X = a, a, b, a, a, b, a, b, a, a$ and $Y = b, a, ba, a, a, b, a, b$. Find a minimum cost edit - sequence that transforms X into Y . Let the cost associated with each deletion and insertion be 1 (for any symbol). Also the cost of changing a symbol to any other is assumed to be 2
- e) How does DFS help in identifying articulation points and bi-connected components? Give an algorithm to determine the bi-components for a given graph. Identify the articulation points and draw the bi-connected components for the following graph.



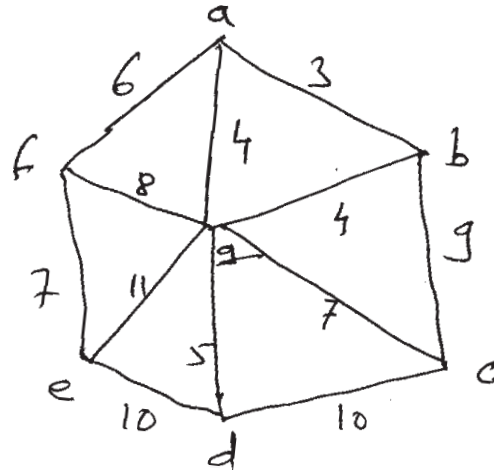
Q4) Attempt any three of the following : **[3 × 4 = 12]**

- a) Show how heap sort processes the input 142, 543, 123, 65, 453, 879, 572, 434, 111, 242, 811, 102.
- b) Find an optimal solution to the unapsack instance
 $n = 7, m = 35, (w_1, w_2, \dots, w_7) = (15, 13, 12, 7, 9, 5, 8)$ and
 $(P_1, P_2, \dots, P_7) = (30, 28, 36, 7, 15, 10, 20)$

- c) State the explicit and implicit constraints in a 8-Queens problem. Give

a solution for the problem using backtracking technique.

- d) What do you mean by a minimum cost spanning tree? Using Kruskal's algorithm, find the minimum cost spanning tree for the following graph.



Total No. of Questions : 5]

SEAT No. :

P869

[Total No. of Pages : 3

[4140] - 203

M.C.A. - I (Under Science Faculty)

CS - 203 : OBJECT ORIENTED PROGRAMMING (C++ PROGRAMMING)

(2008 Pattern) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt any four of the following :

[4 × 4 = 16]

- a) Explain the following terms
 - i) Encapsulation & Data Hiding
 - ii) Message Passing
- b) What are manipulators? Describe the use of following manipulators in brief.
 - i) showbase
 - ii) showpoint
- c) When will you make a function inline? How does an inline function differ from a preprocessor macro?
- d) Explain virtual base class with suitable example.
- e) What are the merits and demerits of procedure oriented programming?

Q2) Attempt any two of the following :

[4 × 4 = 16]

- a) Compare dynamic memory allocation in C and C++.
- b) Explain the following access specifiers in detail
 - i) Private
 - ii) Protected
- c) What is the use of constructor? Comment on the given statement- 'Default values can be assigned to arguments in a parameterized constructor'.
- d) Explain the use of following along with its syntax.
 - i) try block
 - ii) throw statement
 - iii) catch statement
- e) What is an iterator? Explain any two types of iterators.

P.T.O.

Q3) Attempt any two of the following :

[2 × 8 = 16]

- a) Write a C++ program to accept records of 'n' students and store it in an array. The structure is as follows :

```
struct student {  
    int roll_no;  
    char name[20];  
    int total;    };
```

Overload the following search functions:

```
int search (student s[], int n, int roll);
```

```
int search (student s[], int n, char name[]);
```

```
int search (student s[], int n, int total);
```

- b) Design a class person (name, age). Derive a class teacher(teacher id, salary) from person. Derive a class student (student id, std) from person. Derive a class Instructor (Instructor id) from teacher and student. Each class has member functions-accept and display. Write a program to accept details of 'n' instructors and display the details.
- c) Write a C++ program to overload the following operators to perform string operations :
- i) ==Equality
 - ii) +concatenation
 - iii) <<to display a string
 - iv) >> to accept a string

Q4) Attempt any four of the following :

[4 × 4 = 16]

- a) What are the static class members? Explain the important characteristics of static member functions and static data members in brief.
- b) How the binary operators are overloaded in C++ :
- i) as a member function
 - ii) as a friend function? Explain each one with syntax.
- c) Explain the concept of function template and state its features.
- d) What is the concept of allocators? State any two types of allocators.
- e) Explain the following types of inheritance in detail
- i) Multiple Inheritance
 - ii) Hybrid inheritance

Q5) Attempt any four of the following :

[4 × 4 = 16]

- a) Design a class employee (name, dept, salary). Write a C++ program that should throw an exception when salary is less than 0.
- b) Write a C++ program to read a matrix of size m X n. Display the transpose of a matrix on the screen.
- c) State if there are any errors in the following statements.
 - i) `cout.setf (ios:: scientific, ios::left);`
 - ii) `cin.get().get()`
- d) Write a program in C++ to read a file and to display the number of characters and number of lines in the file.
- e) Describe a namespace scope in short.



Total No. of Questions : 5]

SEAT No. :

P870

[Total No. of Pages : 3

[4140] - 204

M.C.A. - I (Science Faculty)

COMPUTER SCIENCE

CS - 205 : Database Management System

(2008 Pattern) (Sem. - II)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume appropriate data, if necessary.*

Q1) Attempt any four of following :

[4 × 4 = 16]

- a) List out different users of database system and explain responsibilities of DBA.
- b) State & explain Thomas Write Rule with example.
- c) What is transaction? Explain states of transactions with diagram.
- d) 2 PL ensures serializability-Comment.
- e) What is Trigger? Explain with syntax.

Q2) Attempt any four of the following :

[4 × 4 = 16]

- a) Let R be a relation schema $R = \{A, B, C, G, H, I\}$
 $E = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow I\}$
Let $X = \{AG\}$ compute $(X)^+$ under F.
- b) Explain Generalization with example.
- c) Explain deadlock prevention techniques.
- d) What is difference between database system and file system?
- e) What are different datatypes in SQL?

P.T.O.

Q3) Attempt any four of the following :

[4 × 4 = 16]

- Explain different types of attributes with example.
- Explain Database system Architecture with diagram.
- Explain 2 tire architecture with diagram.
- Consider the following transactions find out two concurrent schedules which will be serializable to serial schedule (T_1, T_2)

T_1	T_2
R(A)	R(B)
$A = A - 7$	$B = B + 1$
W(A)	W(B)
R(B)	R(1)
$B = B + 7$	$C = (+ 5)$
W(B)	W(C)

- Define SQL discuss several parts of SQL.

Q4) Attempt any four of following :

[4 × 4 = 16]

- Explain group by & order by clause with example.
- Explain desirable properties of decomposition.
- Explain any four aggregate functions in SQL with example.
- Define the terms :
 - Schedule
 - Primary key
 - Lock
 - Roll back
- The following is the list of events in an inteleaved execution if h set of transaction T_0, T_1, T_2 with 2PL.

Time	Transaction	Code
t_1	T_0	lock (A, X)
t_2	T_1	lock (B, S)
t_3	T_2	lock (A, S)
t_4	T_0	lock (C, X)
t_5	T_1	lock (D, X)
t_6	T_2	lock (D, S)
t_7	T_0	lock (C, S)
t_8	T_1	lock (B, S)
	T_2	

Construct a wait - for - graph according to above request. Is there dead lock any instance? Justify.

Q5) Attempt any two : **[2 × 4 = 8]**

- a) i) What are the various problems that occur in concurrent transaction?
- ii) Explain different set operations in SQL.
- iii) What is query processing? Explain with diagram?

b) Attempt any two : **[2 × 4 = 8]**

Consider the following relations

Book (bno, bname, publication, price)

Author (Ano, aname, addr)

Book & Author are related with many to many relationship

- i) Draw an E-R diagram.
- ii) Normalize & design the database with necessary constraints.
- iii) Write SQL query to print authorwise list of books.
- iv) Write SQL query to print book written by author Mr. Kale.



Total No. of Questions : 4]

SEAT No. :

P871

[Total No. of Pages : 4

[4140] - 301
MCA - II (Science Faculty)
COMPUTER SCIENCE
CS - 301 : Design and Analysis of Algorithms
(2008 Pattern) (Sem. - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Neat diagrams must be drawn wherever necessary.*
- 2) Figures to the right indicate full marks.*
- 3) All questions are compulsory.*

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) Define theta notation and show that $4n^2 + 3n$ is $O(n^2)$.
- b) How is Strassen's matrix multiplication technique better than the general method of multiplying two matrices?
- c) Huffman code is a fixed length code. Comment.
- d) What is negative weighted cycle? How does it affect shortest path calculation?
- e) State the sum of subsets problem. Also give the corresponding bounding functions.
- f) How does Branch and Bound help over Dynamic Programming in the TSP?
- g) State what is the topological order of a graph with a suitable example.
- h) What is the co-relation between P, NP-hard and NP-complete problems?

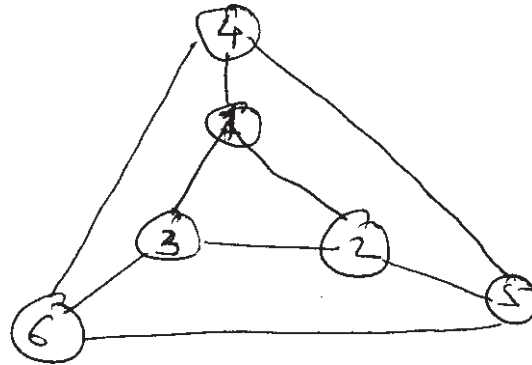
Q2) Attempt any four of the following :

[4 × 5 = 20]

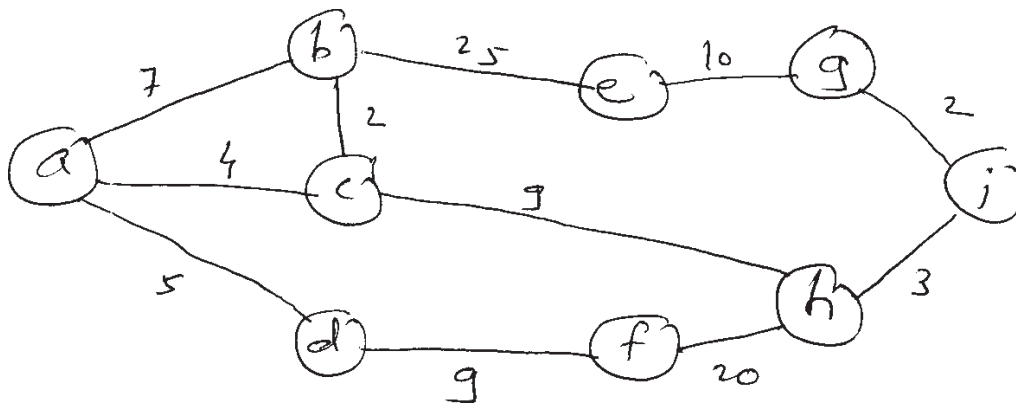
- a) Find optimal binary merge pattern for n files whose lengths are 34, 56, 73, 24, 11, 78, 91. Using a binary merge tree.
- b) Write a linear order sorting algorithm that is also stable. Obtain its space and time complexity.
- c) Draw the state space tree for m-coloring when $n = 3$ and $m = 3$.

P.T.O.

d) Draw the DFS and BFS paths for the following graph



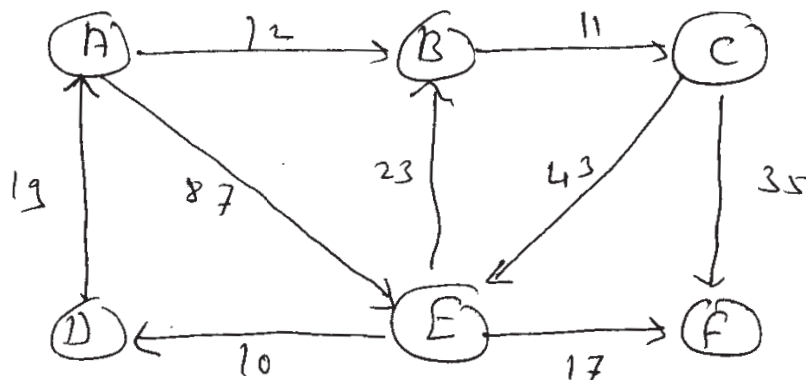
e) Using Dijkstra's algorithm find the shortest path from vertex 'a' to all vertices of the graph



Q3) Attempt any four of the following :

[4 × 8 = 32]

a) Solve the following instance of the single source shortest paths problem with vertex A as the source for the given graph using Dynamic programming. Also write the algorithm for the above problem.

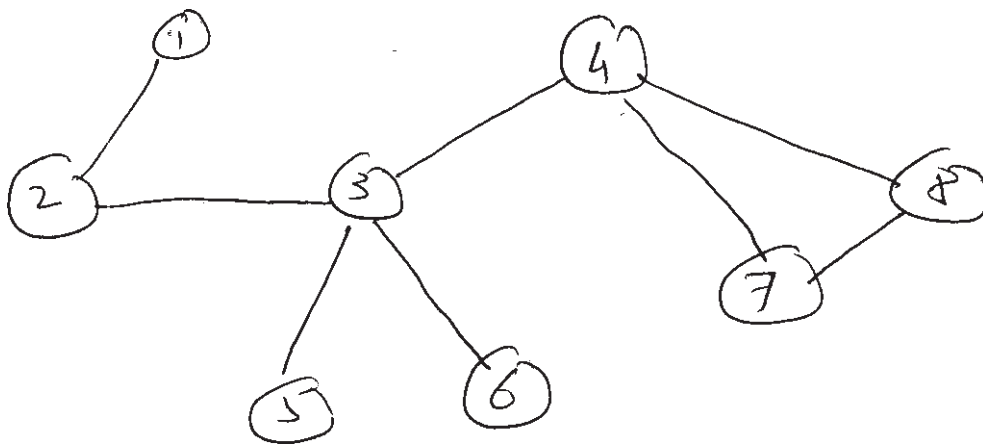


b) Write an algorithm to implement merge sort. Give its recurrence relation and solve it to obtain the time complexity. Solve the following entries using an improved version of merge sort. 20, 35, 18, 8, 14, 41, 3, 39.

- c) Consider the following travelling salesman instance defined by cost matrix. Obtain the reduced cost matrix. Draw state space tree using LCBB.

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

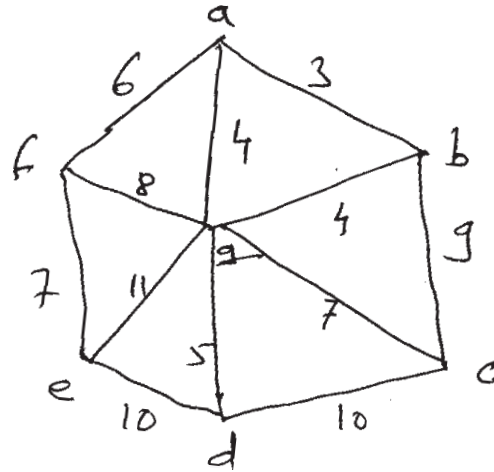
- d) Let $X = a, a, b, a, a, b, a, b, a, a$ and $Y = b, a, b, a, a, b, a, b$. Find a minimum cost edit - sequence that transforms X into Y . let the cost associated with each deletion and insertion be 1 (for any symbol). Also the cost of changing are symbol to any other is assumed to be 2.
- e) How does DFS help in identifying articulation points and bi-connected components? Give an algorithm to determine the bi-components for a given graph. Identify the articulation points and draw the bi-connected components for the following graph.



Q4) Attempt any three of the following : **[3 × 4 = 12]**

- a) Show how heap sort processes the input 142, 543, 123, 65, 453, 879, 572, 434, 111, 242, 811, 102.
- b) Find an optimal solution to the knapsack instance
 $n = 7, m = 35, (w_1, w_2, \dots, w_7) = (15, 13, 12, 7, 9, 5, 8)$ and
 $(p_1, p_2, \dots, p_7) = (30, 28, 36, 7, 15, 10, 20)$

- c) State the explicit and implicit constraints in a 8-Queens problem. Give a solution for the problem using backtracking technique.
- d) What do you mean by a minimum cost spanning tree? Using Kraskal's algorithm, find the minimum cost spanning tree for the following graph.



Total No. of Questions : 5]

SEAT No. :

P872

[Total No. of Pages : 2

[4140] - 302
M.C.A. - II (Science Faculty)
CS - 302 : COMPUTER NETWORKS
(2008 Pattern) (Sem. - III)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) All questions carry equal marks.*
- 3) Figures to the right indicate full marks.*
- 4) Draw diagrams wherever necessary.*

Q1) Attempt All of the following : **[16]**

- a) Which network topologies are suitable for LAN?
- b) Define : Network Architecture, Protocol Stack.
- c) What is hamming distance? How we can increase hamming distance between two messages?
- d) What is pipelining? In what situation pipelining protocols are useful?
- e) Define : Polling, Token passing.
- f) An IP packet arrives with the first 8 bits as 0100 0010. The receiver discards the packet. Why?
- g) What is piggybacking? When it is useful?
- h) Compare Adaptive and Non-Adaptive algorithms.

Q2) Attempt any Four of the following : **[16]**

- a) What is congestion? What are the reasons of congestion? What is the difference between open loop and closed loop solutions?
- b) Explain pure ALOHA and slotted ALOHA.
- c) What are the design issues of the layer?
- d) What are the functions of presentation layer and session layer in OSI model?
- e) What are the factors affect performance of the network?

P.T.O.

Q3) Attempt any Four of the following : **[16]**

- a) Consider a noiseless channel with a bandwidth of 3000 Hz transmitting a signal with two signal levels. What will be the bit rate.
- b) Explain manchester and differential manchester encoding with example.
- c) What is the remainder obtained by dividing $x^7 + x^5 + 1$ by the generator polynomial $x^3 + 1$.
- d) Why length and padding fields are present in Ethernet frame?
- e) What is Network Address translation? What are its advantages and disadvantages?

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

- a) Compare IPV4 and IPV6 packet format.
- b) What are the properties of routing algorithm?
- c) Explain 1-bit sliding window protocol with its advantages and disadvantages.
- d) Compare copper wire and fiber optics.
- e) What are the different transmission modes are available?

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

- a) What are the goals of computer network?
- b) Compare OSI and TCP/IP models.
- c) Compare circuit switching and packet switching.
- d) How CSMA/CD works? Why it is better than CSMA?
- e) Compare FDMA and CDMA.



Total No. of Questions : 5]

SEAT No. :

P873

[Total No. of Pages : 3

[4140] - 303

M.C.A. - II (Science Faculty)

COMPUTER SCIENCE

**CS - 303 : Introduction to System Programming &
Operating System Concepts
(2008 Pattern) (Sem. - III)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *All questions carry equal marks.*
- 3) *Figures to the right indicate full marks.*
- 4) *Neat diagrams must be drawn wherever necessary.*

Q1) Attempt all of the following :

[8 × 2 = 16]

- a) Explain load-time binding and link-time binding.
- b) Explain exec () system call.
- c) Define the difference between preemptive and nonpreemptive scheduling.
- d) List any four operations of a file.
- e) What is spooling?
- f) What is the difference between internal and external fragmentation?
- g) What is pthread?
- h) What is ageing?

Q2) Attempt any four of the following :

[4 × 4 = 16]

- a) Explain in short any four system programs.
- b) Explain acyclic-graph directory structure.
- c) Explain deadlock prevention technique.

P.T.O.

- d) Consider the following set of processes, with the CPU burst time and arrival time.

Process	Arrival Time	Burst Time
P ₁	0	8
P ₂	1	4
P ₃	2	9
P ₄	3	5

Illustrate the execution of these processes using pre-emptive SJF CPU scheduling algorithm. Calculate the average waiting time and average turn around time. Draw gnatt chart.

- e) Explain in short different types of schedulers.

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

- a) Consider the following page - reference string

1,2, 3,4,2,1,5,6,2,1,2,3,7,6,3,2,1,2,3,6.

How many page faults will occur. for following algorithms.

- i) FIFO
 - ii) Optimal
- Number of frames = 3
- b) What resources are used when a thread is created? How do they differ from those used when a process is created.
 - c) Explain least frequently used (LFU) page replacement algorithm and most frequently used (MFU) page replacement algorithm.
 - d) Compare and contrast between following memory allocation algorithm.
 - i) First-fit
 - ii) Best-fit
 - iii) Worst-fit
 - e) Explain the file-system structure.

Q4) Attempt any four of the following :

[4 × 4 = 16]

a) Consider the following snapshot of a system

Process	Allocation				Max				Available			
	A	B	C	D	A	B	C	D	A	B	C	D
P ₀	0	0	1	2	0	0	1	2	1	5	2	0
P ₁	1	0	0	0	1	7	5	0				
P ₂	1	3	5	4	2	3	5	6				
P ₃	0	6	3	2	0	6	5	2				
P ₄	0	0	1	4	0	6	5	6				

Answer the following questions using bankers algorithm

- What is the content of the matrix need?
 - Is the system in a safe state.
- Write a short note on critical region.
 - Explain how a page fault is handled.
 - Write a short note on DMA.
 - Explain the second-chance algorithm.

Q5) Attempt any four of the following :

[4 × 4 = 16]

- Suppose the head of moving head disk with 200 tracks (0 - 199) is currently at track 53. If the request in queue are 98, 183, 37, 122, 14, 124, 65, 67. What is the total head movement to satisfy these request using following scheduling algorithm.
 - Look
 - C-Look
- Explain how a directory is implemented as a linear list and hash table.
- Write a short note on memory mapped files.
- Explain clustered systems & handheld systems.
- What are different operating system services?



Total No. of Questions : 5]

SEAT No. :

P874

[Total No. of Pages : 2

[4140] - 304

M.C.A. - II (Science Faculty)

**CS - 305 : Event Driven Programming (Win 32 SDK)
(2008 Pattern) (Sem. - III)**

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) *Neat diagrams must be drawn wherever necessary.*
- 2) *Figures to the right indicate full marks.*
- 3) *Assume suitable data, if necessary.*
- 4) *All questions are compulsory.*

Q1) Write a complete windows SDK program that is menu driven having following menu items : **[12]**

About - displays a dialog box containing info about the program.

List - displays a table containing item name, description, and price stored in a data source using ODBC API.

Print - displays / prints a message "job done" onto the printer.

Exit - displays a message asking whether to quit and quits if response is 'yes'. (WinMain not required)

Q2) Write program statements using Win32 APIs for any four of the following : **[4 × 5 = 20]**

- a) The application window should display a rectangle covering entire client area with a message "red alert" at the centre of the rectangle in red color.
- b) To create a metafile for drawing an actor symbol in a use-case diagram and displaying actor symbol at the center of the client area.
- c) Implement cut, copy, paste functionality.
- d) Two threads, one displays "Hi" at random position on the screen and second displays "Bye" at random position on the screen.
- e) A ball moving in the client area, bouncing when it hits the window boundaries. The moving of the ball can be suspended by clicking 'stop' menu item and resumed by clicking 'start' menu item.

P.T.O.

Q3) Answer in brief any eight : **[8 × 2 = 16]**

- a) What is critical section? Give one API associated with it.
- b) Give message that helps in painting on owner draw buttons? How?
- c) In what way PeekMessage differs from GetMessage?
- d) What alterations are necessary for the message loop if mode less dialog box is used?
- e) Which data structure stores the dimensions of screen? How to get these values?
- f) What messages are exchanged between a client and a server in case of hot link DDE?
- g) How common controls can be used in a program?
- h) Which API functions are essential for obtaining device context handle?
- i) What are the contents of wParam and lParam for mouse messages?
- j) What is WM-SIZE message? How and Why it is generated?

Q4) Justify True/False : (any six) : **[6 × 2 = 12]**

- a) WM-TIMER is low priority message.
- b) The edit control provides built-in cut, copy, paste functionality.
- c) System menu cannot be modified.
- d) A window which receives WM-LBUTTONDOWN message always receive its corresponding WM-LBUTTONUP message.
- e) An application requiring input focus calls CreateCaret during WM-CREATE message.
- f) Static controls text cannot be changed dynamically.
- g) WinMain always calls WndProc.
- h) Scroll bar, status bar are all predefined window controls.

Q5) Attempt any Four : **[4 × 5 = 20]**

- a) Discuss memory management in Windows 98.
- b) Differentiate : SDI Vs. MDI.
- c) Write a note on Event object.
- d) How to obtain device context handle? Explain.
- e) Compare & Contrast dialog procedure and WndProc.



Total No. of Questions : 5]

SEAT No. :

P875

[Total No. of Pages : 4

[4140] - 401

M.C.A. (Under Science Faculty)

CS - 401 : INTRODUCTION TO UNIX AND UNIX INTERNALS

(Sem. - IV) (2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

- 1) *Figures to the right indicate full marks.*
- 2) *Neat Diagrams must be drawn whenever necessary.*
- 3) *All questions are compulsory.*
- 4) *All questions carry equal marks.*
- 5) *Assume Suitable data, if necessary.*

Q1) Attempt ALL of the following:

[8 × 2 = 16]

- a) Describe the meaning of the following Shell Command:
\$nroff-mm <doc1> doc1.out 2 > errors
- b) What do you mean by trap/chmk?
- c) What happens when process executes close (1) and then dup with an already opened file?
- d) Suppose kernel does a delayed write of a buffer containing copy of disk block 57. Assume that the buffer is now free. What happens when another process calls getblk for disk block 57?
- e) Which permissions are needed for the process on / and etc directories to delete an existing file named "test" in a directory "/etc"? Assume that the process current working directory is "/usr/bin".
- f) What is the link count of a directory? Justify your answer.
- g) What do you mean by generic system call handler? What is its purpose?
- h) What do you mean by COW bit associated with page?

Q2) Justify True/False: Attempt Any Four of the following:

[4 × 4 = 16]

- a) A process can access its u area only when it executes in user mode.
- b) The kernel must always prevent the occurrence of interrupts during critical activity.
- c) Device file inodes do not have Table of Contents.
- d) Processes go to sleep for sure events only.
- e) Process never calls system calls directly.

P.T.O.

Q3) Attempt Any Four of the following:

[4 × 4 = 16]

- a) Explain how kernel executes the following command line with the help of suitable diagram:

```
mount / dev / disk 1 / usr
```

```
cd / usr / src / uts
```

```
cd.. / .. / ..
```

- b) Consider the following C code snippet and its generated assembly code. Explain with suitable diagram, how kernel makes provision to catch signal handler function.

```
# include < signal.h >
```

```
main ()
```

```
{
```

```
    extern f ();
```

```
    signal (SIGINT, f);
```

```
    kill (0, SIGINT);
```

```
}
```

```
f() { }
```

```
//assembly code
```

```
Addr          Instruction
```

```
_main ()
```

```
...
```

```
f9:           jsr 0 x 108
```

```
100:
```

```
...
```

```
_f()
```

```
104:          ret
```

```
...
```

```
_kill
```

```
...
```

```
10a:          chmk/trap
```

```
10c:          ...
```

- c) Assume that 3 processes A, B, and C arrive in the system almost simultaneously. Their initial priority is 60. How these processes will be executed on the UNIX system using simple scheduler for the next 6 time quantum (1 time quantum = 1 second)? Assume that no processes ever want to make system calls.

- d) Consider the following sequence of commands:

```
grep main a.c b.c c.c > grepout &
wc -l < grepout &
rm grepout &
```

 Why is this not equivalent to the following command line? Justify.

```
grep main a.c b.c c.c | wc -l
```
- e) Describe various scenarios that can happen in algorithm breada. What happens on the next invocation of bread or breada when the current read-ahead block will be read?

Q4) Attempt Any Four of the following: [4 × 4 = 16]

- a) Write a C program which takes multiple file names as command line argument, and then prints its inode number.
- b) Write a C program which creates 5 children, and then waits for termination of all children using appropriate system calls, and then prints total cumulative time children spent in user mode and kernel mode.
- c) Explain behavior of the following C program:

```
main () { char *endpt; char *sbrk (); int brk (); endpt = sbrk (0);
While (endpt--){
    if(brk(endpt) == -1) {printf("brk of %ud failed \n", endpt);
exit ();}
} }
```
- d) Explain behavior of the following C program:

```
#include <fcntl.h>
main (int argc, char * argv [])
{int fd, skval; char c;
if (argc != 2) exit ();
fd = open (argv [1], O_RDONLY);
if(fd == -1) exit ();
while ((skval = read (fd, &c, 1)) == 1)
{
    printf("char%c\n",c);
    skval = lseek (fd, 1023L, 1);
    printf("new seek val %d\n", skval);
} }
```
- e) Write a shell script to determine whether given command line argument (\$1) contains "*" symbol or not, if \$1 does not contains "*" symbol, add it to \$1, otherwise show message "Symbol is not required".

Q5) Attempt Any Four of the following:

[4 × 4 = 16]

- a) Which system call is used to send signal to another process? Explain its usage.
- b) What do you mean by environment pointer variables list? How to get/set those values?
- c) If the swapper attempts to swap out a process but cannot find space on the swap device, a system deadlock is possible. Explain How?
- d) Suppose a user's current working directory is /usr/mnt/kaumu. If the administrator mounts a new file system on the /usr/mnt directory, how will it affect this user? Would the user be able to continue to see the files in kaumu? What would be the result of a pwd command? What other commands would behave unexpectedly?
- e) Explore various anomalies in the treatment of sleep.



Total No. of Questions : 5]

SEAT No. :

P876

[Total No. of Pages : 2

[4140] - 402

M.C.A. - II (Science Faculty)

CS - 402 : Advanced Networking & Mobile Computing

(Sem. - IV) (2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

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

Q1) Attempt All:

[8 × 2 = 16]

- a) What are the different types of mobile services?
- b) Explain the term Handoff.
- c) What are location dependent services?
- d) Explain the term Cluster.
- e) A TCP connection is using a window size of 12000 bytes, and the previous acknowledgement number was 22,001. It receives a segment with acknowledgement number 24,001 and window size advertisement of 12,000. Draw a diagram to show the situation of the window before and after.
- f) What is congestion control?
- g) What is Non-persistence connection in HTTP?
- h) Give any two uses of UDP.

Q2) Attempt any four of the following:

[4 × 4 = 16]

- a) What are the main reasons for using cellular system? How SDM is typically combined with FDM.
- b) Explain following terms.
 - i) Blocking
 - ii) Scattering.
- c) What are the services of user Agent in SMTP?
- d) Compare FDMA, TDMA & CDMA.
- e) What is spread spectrum system? How can DSSS benefit from?

P.T.O.

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

- a) Define small scale fading. Compare fast fading with slow fading.
- b) Explain the E-Mail Architecture.
- c) Write a short note on WTLS?
- d) What are the main problems of signal propagation? Why is reflection both useful and harmful?
- e) Write a short note on NAV.

Q4) Attempt Any Four of the following: [4 × 4 = 16]

- a) Why are so many different identifiers/address needed in GSM? Give reason.
- b) What is handover? Explain with example.
- c) How does registration on layer 3 of a mobile node work?
- d) What is the reaction of standard TCP in case of packet loss? In what situation does this reaction make sense?
- e) Name the advantages and disadvantages of user acknowledgement in WTP. What are typical applications for both classes?

Q5) Attempt Any Four of the following: [4 × 4 = 16]

- a) Explain IP packet delivery in mobile network layer.
- b) Write a short note on
 - i) DCF
 - ii) Reverse Tunneling.
- c) Explain Active and passive Hub?
- d) Explain the snooping TCP. Give advantages and disadvantages.
- e) Explain WWW Architecture?



Total No. of Questions : 4]

SEAT No. :

P877

[Total No. of Pages : 3

[4140] - 403

M.C.A. - II (Science Faculty)

CS - 403 : Distributed Database Systems

(2008 Pattern) (Sem. - IV)

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 all :

[8 × 2 = 16]

- a) Explain shared Disk multiprocessor system.
- b) Define :
 - i) Access frequency
 - ii) Minterm predicates.
- c) State different layers of query processing.
- d) Define the join selectivity factors for a pair of relations R & S?
- e) Define : i) Dirty read ii) Non-repeatable read
- f) Differentiate MTBF & MTTR.
- g) Define : i) LWFG ii) GWFG
- h) Give two architectural alternative of DDBMS?

Q2) Attempt any four :

[4 × 5 = 20]

- a) What are disadvantages of DDBMS?
- b) Write a short note on MDBS architecture.
- c) Explain distributed design issues.
- d) Explain any five characteristics of query processors.
- e) What are the different types of transactions?

P.T.O.

Q3) Attempt any four :

[4 × 6 = 24]

a) Explain whether following schedule are serial or non-serial?

S1 : {W2(X), R1(X), W1(x),C1, R3(x), W2(y), R3(y),
R2(z),C2, R3(z),C3}

S2 : {R2(z), W2(x), W2(y),C2, W1(x), R1(x), A1, R3(x),
R3(z),R3(y),C3}

b) Give the query graph for the following query,

Select ename, pname

from emp, asg, proj

where asg.dur < 24

and emp. eno=asg.eno

and emp.title = "Manager"

and asg.pno = proj. pno

c) Let $Q = \{q1, q2, q3, q4, q5\}$ be the set of queries,

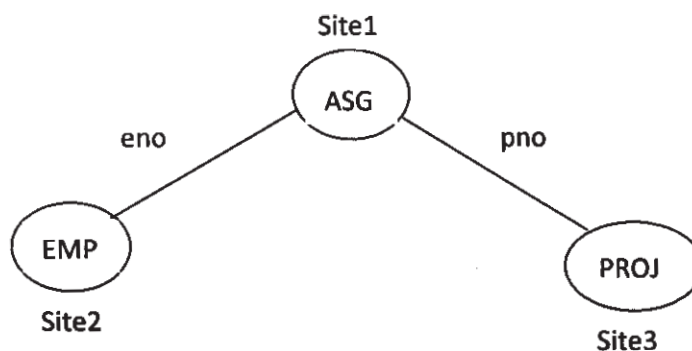
$A = \{A1, A2, A3, A4, A5\}$ be the set of attributes,

$S = \{S1, S2, S3\}$ be the set of sites

Use matrix A & B. Do the vertical fragmentations of set of attributes using BE algorithm.

	A1	A2	A3	A4	A5		S1	S2	S3
q1	0	1	1	1	0	q1	25	6	0
q2	1	1	1	0	0	q2	20	5	0
q3	1	1	0	0	0	q3	15	0	0
q4	0	0	0	1	1	q4	0	0	35
q5	0	0	1	1	1	q5	0	25	20
	A						B		

d) Consider the following join graph,



Total No. of Questions : 4]

SEAT No. :

P878

[Total No. of Pages : 2

[4140] - 404

M.C.A. (Science Faculty)

CS - 405 : Object Oriented Software Engineering

(Sem. - IV) (2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

- 1) *Figures to the right indicates full marks.*
- 2) *Neat Diagrams must be drawn whenever necessary.*
- 3) *All questions are compulsory.*

Q1) Attempt the following:

[8 × 2 = 16]

- a) What is forward Engineering.
- b) Write the difference between specialization and generalization.
- c) Which are the different types of Actors in use case diagram.
- d) Which are the components in a deployment diagram.
- e) What is the significance of role names in an object diagram.
- f) What are Packages.
- g) Which are the categories of requirement.
- h) Briefly explain the Inception concept.

Q2) Attempt ANY FOUR of the following:

[4 × 8 = 32]

- a) The 'Passport Office' needs to computerize their system such that all the offices distributed over different cities are connected to the main office located in 'Pune' city. The customer needs to fill a form where he mentions his name, address, phone, date-of-birth, identity mark etc. The system should take care of issue of New passport and cancellation. Draw the following:
 - Use case diagram
 - Class diagram
 - Sequence diagram
 - Object diagram
- b) Draw a DFD for Railway Reservation system. The passenger is required to fill in a reservation form for giving details for his journey. The counter clerk ensures whether the place is available and prepares a booking statement.

P.T.O.

- c) Prepare a class diagram giving the attributes and operations and state transition diagram for a circular queue.
- d) Draw state diagram and sequence diagram for considering different scenarios for Laptop selection.
- e) Draw a use case diagram for eMail system.

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

- a) Write a note on Resource Management component.
- b) Draw a sequence diagram for issuing College I-card.
- c) Discuss the Software development life cycle.
- d) Write a note on UP phases.
- e) Explain the concept of concurrency and subsystem allocation.

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

- a) Draw a class diagram for management of Savings account in a Banking system.
- b) What is a Rational Unified Process.
- c) Draw an activity diagram for the different operations supported by coffee making machine.
- d) Discuss the importance and principles of Object Oriented Modeling.
- e) Write a note on Agile modeling.



Total No. of Questions : 5]

SEAT No. :

P879

[Total No. of Pages : 2

[4140] - 501
M.C.A. (Sem. - V)
Science Faculty
CS - 501 : Cryptography and Network Security
(2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

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

Q1) Attempt all of the following:

[8 × 2 = 16]

- a) Write down the phases that a virus goes through during its lifetime.
- b) Which parties are involved in KERBEROS Protocol?
- c) What are the characteristics of Firewall?
- d) List the strengths of MD 5.
- e) Write the steps in creation of Digital Certificates.
- f) How Message Digests are used to avoid the storage & transmission of Clear Text Passwords?
- g) What are the different types of Access Control?
- h) Consider the following Plain Text.
“UNIVERSITY OF PUNE IS THE BEST”
The key to encrypt the text is an alphabet 4 places down the line. Using Caesar Cipher construct Cipher text.

Q2) Attempt any four of the following:

[4 × 4 = 16]

- a) What is virus? What are the various categories of virus?
- b) Write the steps to achieve better security.
- c) Explain the following concepts in detail.
 - i) Phishing
 - ii) Pharming (DNS Spoofing)
- d) Explain Double DES encryption and Double DES decryption.
- e) Explain encryption process in RC5.

P.T.O.

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

- a) Explain in short the types of algorithms and modes of algorithm.
- b) Explain the following:
 - i) Public key cryptography.
 - ii) Man-in-the-middle attack.
- c) What are the problems of Diffie - Hellman Key exchange algorithm?
- d) Comment : SSL is located between application and transport layers.
- e) How the randomness is added to message digest scheme of clear text passwords?

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

- a) Discuss the broad level steps in DES and list the steps of one round in DES.
- b) What is Stagenography? What are the uses of Stagenography?
- c) Explain Handshake Protocol in brief.
- d) Explain the mathematical theory behind Diffie-Hellman key exchange algorithm.
- e) Write down the steps to verify digital certificates.

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

- a) Consider the plain text.
“MCA”
Using Hill Cipher construct the cipher text. Let the key matrix be

$$\begin{bmatrix} 6 & 24 & 1 \\ 13 & 16 & 10 \\ 20 & 17 & 15 \end{bmatrix}$$

- b) Consider the plain text
“MCA SEMESTER FIVE”
One time pad is QACDZMOUXGIJNVB
Using Vernam Cipher construct the cipher text.
- c) Apply Play Fair technique and convert the following plain text into cipher text, Plain text : EXAMINATION SECTION.
- d) Consider the values of $n = 17$ and $g = 13$. Apply Diffie - Hellman Algorithm and generate keys K_1 and K_2
- e) Consider the plain text “10”. Let $P = 7$ and $Q = 17$. Construct the cipher text using RSA algorithm and also decrypt the cipher text you have constructed to get the original plain text.



Total No. of Questions : 5]

SEAT No. :

P880

[Total No. of Pages : 2

[4140] - 502

M.C.A. (Science Faculty)

CS - 502 : Internet Programming Using PHP

(Sem. - V) (2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

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

Q1) Attempt all of the following:

[8 × 2 = 16]

- a) State the difference between GET and POST methods.
- b) What do you mean by variable interpolation?
- c) State the types and examples of array in php.
- d) How to find number of properties and methods of given class?
- e) What is cookie?
- f) List the built in constructs to display array contents.
- g) How to handle session?
- h) What is JSON?

Q2) Attempt any four of the following:

[4 × 4 = 16]

- a) Write note on XML document structure.
- b) What is DOM and how does it relate to XML?
- c) How can you get the XML response?
- d) Write note on ereg () builtin construct.
- e) Explain how browser reads XML.

P.T.O.

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

- a) Write a program to accept two strings and count number of times second string occurred in first.
- b) Write a php script to accept file name and - list all files with same name and any extension.
- c) Write a php program to accept customer detail on first page, item purchased on second page and display bill on third page.
- d) Write a php script to find common elements of two arrays.
- e) Write a php script to create a base class employee, derive the class and then apply introspection builtin constructs to find methods and properties of both.

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

- a) Write a php script to keep track of number of times the web page has been accessed.
- b) Write note on \$_SERVER.
- c) Write note on self processing form.
- d) Explain how cookie and sessions are combined with suitable example.
- e) What is use of heredoc in php using suitable example?

Q5) Attempt anyfour: **[4 × 4 = 16]**

- a) Write note on internet mail protocol.
- b) Explain any five builtin string functions.
- c) Write note on anonymous or lambda function.
- d) JSON response into a variable from the script. Comment.
- e) Write any four builtin constructs to handle file with example in php.



Total No. of Questions : 5]

SEAT No. :

P881

[Total No. of Pages : 2

[4140] - 503

M.C.A. - III (Under Science Faculty)

COMPUTER SCIENCE

CS - 503 : Design Pattern

(Sem. - V) (2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Attempt the following:

[8 × 2 = 16]

- a) What is pipe and filter architectural pattern?
- b) State the elements of Design pattern.
- c) Which are the participants of Abstract factory design pattern?
- d) What is the intent of Proxy design pattern?
- e) State participants of command design pattern.
- f) What is an intent of broker architectural pattern?
- g) What is an Idiom?
- h) “Idioms are less ‘Portable’ between programming language.” justify.

Q2) Attempt the following (Any Four):

[4 × 4 = 16]

- a) What is pattern? What are the pattern categories?
- b) Explain the steps to implement Broker architectural pattern.
- c) Explain the structure and consequences of model view controller architectural pattern?
- d) Explain the stepwise refinement approach for layered architectural pattern.
- e) Give the consequences of Black Board architectural pattern.

P.T.O.

Q3) Attempt the following (Any Four): **[4 × 4 = 16]**

- a) What are the benefits of prototype Design Pattern?
- b) Give the intent and implementation issues of single tone design pattern.
- c) What are the structure and participants of prototype design pattern?
- d) What are the benefits of Abstract factory design pattern?
- e) Write a note on catalog organization of design pattern.

Q4) Attempt the following (Any Four): **[4 × 4 = 16]**

- a) What is the Decorator design pattern? What are the uses of it?
- b) Explain the proxy design pattern with the help of structure and participants?
- c) Give structure of class and objects of Adapter design pattern.
- d) Explain the participants and benefits of Decorator design pattern.
- e) Give the structure and participants of observer design pattern.

Q5) Attempt the following (Any Four): **[4 × 4 = 16]**

- a) Explain strategy design pattern with the help of structure and implementation issues.
- b) What are the consequences of command design pattern.
- c) What are the strength and weakness of strategy design pattern?
- d) Explain counted pointer Idioms with the steps of implementation.
- e) Explain Intented control flow style guide Idiom.



Total No. of Questions : 5]

SEAT No. :

P882

[Total No. of Pages : 2

[4140] - 504
M.C.A. - III (Sem. - V)
Science Faculty
COMPUTER SCIENCE
CS - 505 : Software Testing & Quality Assurance
(2008 Pattern)

Time :3Hours]

[Max. Marks :80

Instructions to the candidates:-

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

Q1) Attempt all of the following:

[8 × 2 = 16]

- a) Explain importance of testing.
- b) Explain Technical Reviews.
- c) What is system testing?
- d) Define Beta testing.
- e) Define Driver.
- f) Explain testing document & help facilities.
- g) What is Pareto Principle?
- h) Explain software safety.

Q2) Attempt any FOUR of the following:

[4 × 4 = 16]

- a) Explain scatter Diagram Patterns.
- b) Explain Regression testing.
- c) What are testing fundamentals?
- d) Explain statistical Quality Assurance in detail.
- e) Write a short note on winrunner.

P.T.O.

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

- a) What are the steps for constructing cause effect diagram?
- b) Explain white Box testing in detail.
- c) Write a short note on graph matrix.
- d) What is cyclomatic complexity?
- e) Explain six-sigma Quality in detail.

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

- a) What is effective strategy for testing real-time system.
- b) Differentiate between validation & verification.
- c) Explain basic software testing principles.
- d) How Quality costs is used for decision making? Explain with eg.
- e) Explain stress testing & performance testing.

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

Write a short note on

- a) SQA activities.
- b) ISO 9000 Quality standards.
- c) Software Reviews.
- d) Loadrunner.
- e) Size Oriented Metrics.

