

Total No. of Questions : 5]

SEAT No. :

P3210

[Total No. of Pages : 4

[5541] - 11

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

CS - 101 : C-Programming  
(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

Instructions to the candidates:

- 1) Neat diagrams must be drawn whenever necessary.
- 2) All questions carry equal marks.
- 3) All questions are compulsory.

Q1) a) Trace the output (any two) :

[2 x 4 = 8]

i)     main ( )  
       {  
       int i = 4, j = 2 ;  
       junk (& i, j) ;  
       printf (“%d%d”, p, j) ;  
       }  
       junk (int \* i, int j)  
       {  
       \* i = \* i \*\* i ;  
       j = j \* j ;  
       }

ii)    main ( )  
       {  
       static char city [20] = “Nagpur” ;  
       int i = 0 ;  
       while (city [ i ]  
       printf (“ % c”, city [ i ++]);  
       }

P.T.O.

```

iii)    main ( )
        {
        union a
        {
        int i ;
        char ch [ 2 ] ;
        } ;
        union a u ;
        u. i = 256 ;
        printf ( “ % d % d % d ” , u. i , u. ch [ 0 ] , u.ch [ 1 ] ) ;
        }

```

b) Find out errors & explain (any two):

[2 x 4 = 8]

```

i)      main ( )
        {
        int size = 10 ;
        int arr [size] ;
        for (p = 1 ; i <= size ; i ++ )
        {
        scanf ( “ %d ” , & arr [ i ] ) ;
        printf ( “ in%d ” , arr [ i ] ) ;
        }
        }

```

```

ii)    main ( )
        {
        struct employee
        {
        char name [ 30 ] ;
        int age ;
        float basal ;
        }
        struct employee e , * ptr ;
        e → age = 40 ;
        ptr. age = 30 ;
        printf ( “ % d %d ” , e → age , ptr.age ) ;
        }

```

```

iii)    main ( )
        {
            void add (int i, j) ;
            add (10, 15) ;
        }
        void add (i , int j)
        { printf (“ % d”, i + j)
        }

```

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

- a) Explain the purpose of switch statement. Give it's syntax.
- b) Explain preprocessor directives.
- c) What is a file? Explain different modes of file.
- d) Differentiate between logical & bitwise operators.
- e) What is a function? What are the advantage of function.

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

- a) What is Dynamic Memory Allocation? Explain four functions used in Dynamic Memory Allocation.
- b) What is a pointer? Explain the advantages of using pointer.
- c) What is the difference between structure and union?
- d) What is the purpose of goto statement? What are the draw backs of using go to statement?
- e) Explain any four functions of string from standard library.

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

- a) Write a 'C' program to display rowwise, coloumwise sum of elements of matrix.
- b) Write a 'C' program to display  $x^n$ . Use recursive function.
- c) Write a 'C' program to check whether accepted number is palindrome or not.

d) Write a 'C' program to display the following output.

```
          a
        a  b
      a  b  c
    a  b  c  d
```

e) Write a 'C' program to compare two strings using user-defined function.

**Q5)** Attempt any four of the following :

**[4 x 4 = 16]**

- Write a 'C' program to read a file "try.txt" & count no. of alphabets, numbers from it.
- Write a 'C' program to accept information of 10 employees (empno, name, city) & display employees from 'Pune' city.
- Write a 'C' program to display addition of elements of an array using pointers.
- Write a 'C' program to accept number using command line arguments and calculate it's factorial.
- Write a 'C' program to display first 'n' terms of fibonacci series.



Total No. of Questions : 5]

SEAT No. :

P3211

[Total No. of Pages : 2

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

COMPUTER SCIENCE

CS - 102 : Computer Architecture

(2008 Pattern)

*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 indicates full marks.*

**Q1)** Attempt any four :

**[4 × 4 = 16]**

- a) What is register? Explain 4-bit SISO shift register using D-Flip-flop.
- b) Define interrupt. Explain hardware interrupts in microprocessor.
- c) State any four features of ISA bus.
- d) What is interface? Explain serial communication interface.
- e) Compare 80286 with 80386 microprocessor.

**Q2)** Attempt any two :

**[2 × 8 = 16]**

- a) Explain with neat block diagram the concept of data transfer using DMA controller.
- b) State the size in bits of following registers in 32 bit microprocessor. Explain their functions.
  - i) CS-register.
  - ii) SI-register.
  - iii) CL-register.
  - iv) BP-register.
- c) Explain arithmetic co-processor 80287.

**P.T.O.**

**Q3) Attempt any four :**

**[4 × 4 = 16]**

- a) Explain three segment instruction pipeline.
- b) What is demultiplexer and explain 1 : 4 DMUX using proper logic diagram?
- c) State pin functions of USB connector and write features of USB.
- d) How does the analog voltage is converted into its equivalent digital form using successive approximation method.
- e) State features of CISC architecture.

**Q4) Attempt any four :**

**[4 × 4 = 16]**

- a) Write long form of VESA in computer bus system. State advantages and disadvantages of VISA.
- b) Describe the sequence of steps involve in interrupt execution.
- c) Explain half adder circuit with proper logic diagram.
- d) Explain binary weighted register circuit for digital to analog conversion.
- e) State features of pentium pro processor.

**Q5) Attempt any two :**

**[2 × 8 = 16]**

- a) With neat block diagram of IC 8255 explain its function in I/O mode O.
- b) How is parallel processing implemented in uniprocessor computer system.
- c) Explain 3-bit synchronus up counter and down counter.



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SEAT No. :

P3213

[Total No. of Pages : 3

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

CS - 103 : Mathematical Foundations

(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 four of the following :

[16]

- a) Let  $A = \{1, 2, 3, 4, 5\}$  Find the power set of A. How many elements are there in power set of A.
- b) Prove that  $(P \cup Q)^c = P^c \cap Q^c$ .
- c) Find *g.c.d.* of 8699 and 3392 and express it in linear combinations of 8699 and 3392.
- d) Give an example of function which is not onto. Justify your answer.
- e) Let  $\sim$  be an equivalence relation on a set A. Show that it forms the partition.
- f) Let  $p$  be a prime number.  $a, b \in \mathbb{Z}$  be such that  $p|ab$  show that either  $p|a$  or  $p|b$ .

Q2) Attempt any four of the following :

[16]

- a) Let  $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^3 - 1$  and  $g: \mathbb{R} \rightarrow \mathbb{R}, g(x) = 2 + x^2$ . Find  $(f \circ g)(x)$  and  $(g \circ f)(x)$ .
- b) Find the solution for the following system of congruences  
 $x \equiv 1 \pmod{3}, x \equiv 5 \pmod{7}, x \equiv 6 \pmod{17}$ .
- c) Let  $X = \{1, 2, 3, 5, 6, 10, 15, 30\}$  and let R be the relation  $/$ , divides on X. Draw the Hasse diagram of R.

P.T.O.

- d) Find the inverse of 3 modulo 19.
- e) Find the remainder when  $3^{740}$  is divided by 17.
- f) Give an example of a relation with the property that it is reflexive and not symmetric. Justify your answer.

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

- a) Use Remainder theorem to find remainder when  $2x^4 + x^3 - 3x + 4$  divided by  $x - 4$ .
- b) Find the order of the following permutation  $\begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 4 & 5 & 3 & 2 & 1 & 7 & 6 & 8 \end{pmatrix}$ .
- c) Write the composition table of  $Z_9$  under the operation  $\times_9$  and  $+_9$ .  
(Multiplication modulo 9 and addition modulo 9 respectively).
- d) Prove that  $U(12) = \{\bar{1}, \bar{5}, \bar{7}, \bar{11}\}$  is a group with respect to the operation multiplication modulo 12.
- e) Find all roots of the polynomial  $f(x) = x^4 + 4x^3 + 6x^2 + 4x + 1$ .
- f) Define the composition of two functions Also Prove that  $(g \circ f)^{-1} = f^{-1} \circ g^{-1}$ .

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

- a) Find the inverse of the matrix by adjoint method.  $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \\ 8 & 9 & 1 \end{bmatrix}$   
(if exists).
- b) Solve the system of equations by using cramer's rule.
 
$$\begin{aligned} x - y - z &= 6 \\ 2x - 4y + 4z &= 19 \\ x + 3y - 2z &= 13 \end{aligned}$$
- c) Let G be a group show that identity element  $e \in G$  is unique.



- d) What is coefficient of  $x^4 y^7$  in  $(x + y)^{11}$ .
- e) Determine whether the function  $f: Z \times Z \rightarrow Z$  defined by  $f(m, n) = m^2 + n^2$ .
- f) With the help of Venn diagram Prove that  $(A \cup B) \cap A^c = B - A$ .

**Q5)** Attempt any four of the following :

**[16]**

- a) Draw the truth table for  $(P \rightarrow Q) \leftrightarrow (\sim P \vee Q)$  Is it a tautology.
- b) Show that  $P \leftrightarrow Q$  and  $(P \rightarrow Q) \wedge (Q \rightarrow P)$  are logically equivalent by developing a series of logical equivalences.
- c) Show that  $P \vee Q$  and  $(\sim P \rightarrow Q)$  are logically equivalent by constructing truth table.
- d) Give a proof by contradiction of theorem If  $n$  is an integer and  $8n + 2$  is odd then  $n$  is odd.
- e) Prove that if  $x$  and  $y$  are odd, the  $xy$  is odd.
- f) Prove that  $\sqrt{2}$  is irrational (proof by contradiction).



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

CS - 105 : Graph Theory

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

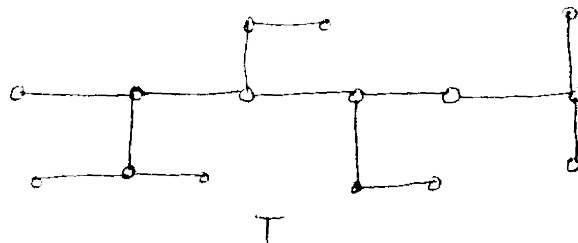
Instructions to the candidates:

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

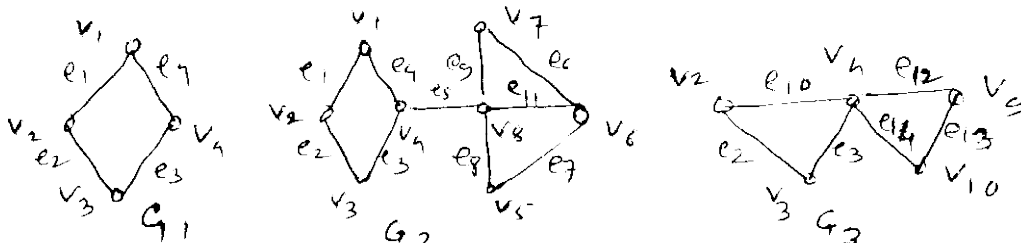
Q1) Attempt any four of the following :

[16]

- a) Explain Konigsberg Seven bridge Problem.
- b) Draw the following graphs :
  - i) Bipartite graph on 12 vertices.
  - ii) Complete graph of 6 vertices.
- c) Find the eccentricity of each vertex in the trees given below. Find the centre, radius and diameter of the following trees.



d) For the graph  $G_1$ ,  $G_2$  and  $G_3$  given below, Find  $G_2 \oplus (G_1 \oplus G_3)$ .



- e) Solve the following recurrence relation  $a_n = a_{n-1} + a_{n-2}, a_0 = 0, a_1 = 1$ .
- f) Draw the graph of the following incidence matrix and find the square of underlying graph (composition of graph with itself)

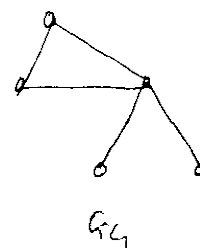
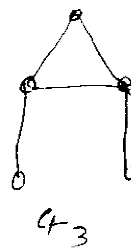
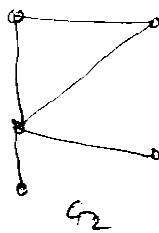
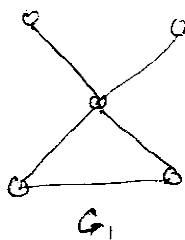
$$I(G) = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 1 & 1 & 0 & 1 & 0 \end{bmatrix}$$

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

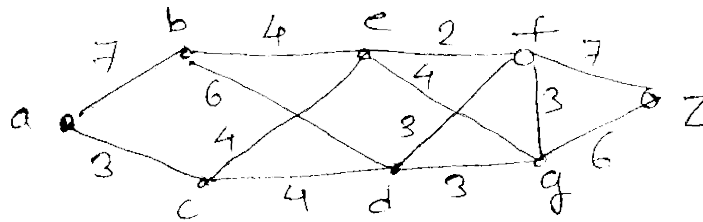
- Can there be a directed graph with 6 vertices where the outdegrees are 2, 4, 1, 1, 5 and 2 and the indegrees are 2, 3, 4, 1, 0 and 5?
- Determine the minimum number of vertices in the simple graph with 19 edges. Also draw such graph.
- Show that complement of complement of graph is original graph.
- Define Regular graph and complete graph.
- Any connected graph with  $n$  vertices and  $n - 1$  edges is a tree.
- Write the fusion algorithm for the connectness of the graph.

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

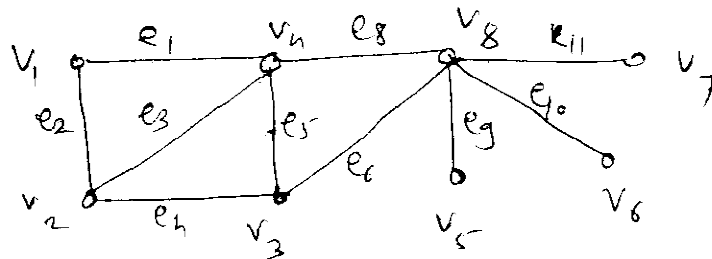
- Prove that a simple graph with  $n$  vertices must be connected if it has more than  $\frac{(n-1)(n-2)}{n}$  edges.
- Which of the following pairs of graphs are isomorphic label the vertices of each graph appropriately to bring out the isomorphism?



- c) Find the minimal spanning tree for following connected weighted graph using prism algorithm.



- d) Let  $G$  be the graph given below. Find  $G[U]$  and  $G[F]$ , where  $U = \{v_1, v_2, v_3\}$  and  $F = \{e_2, e_4, e_6, e_8\}$  and  $G[X]$  means  $G$  induced by set  $X$ .



- e) Find the Hamiltonian circuit in the nanogon graph. Draw it.  
 f) Draw the arborescence and express in polish notation, the expression is

$$ab + \frac{3dc}{3e} + f$$

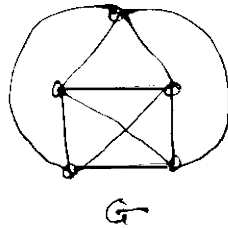
**Q4)** Attempt any four of the following : [16]

- Prove that a simple graph and its complement cannot both be disconnected.
- Find the maximum vertex connectivity of a graph with 6 vertices and 14 edges. Draw the graph showing that they are achieved.
- Explain the travelling salesman problem.

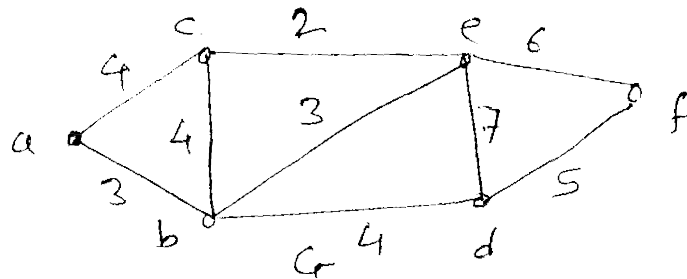
- d) Write the steps of Breadth first search algorithm.
- e) Solve the recurrence relation  $a_n - 10a_{n-1} + 25a_{n-2} = 3 + 7n$ .
- f) Write a note on Chinese postman problem.

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

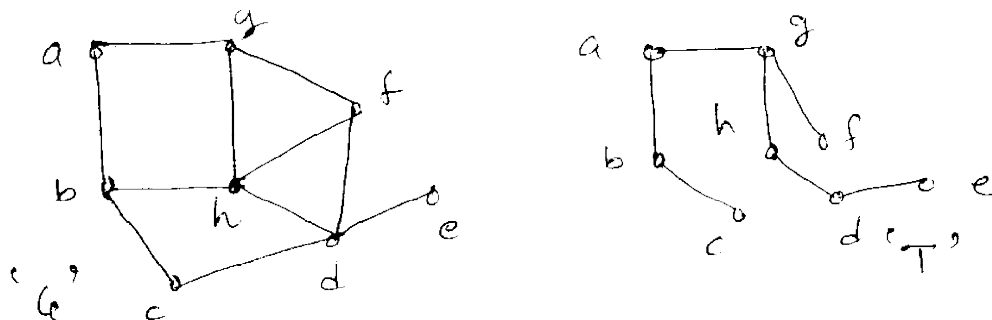
- a) Using Fleury's algorithm find the euler tour in the following graph G.



- b) Using Dijkstra's algorithm. Find the shortest path from vertex 'a' to all vertices in the weighted graph below.



- c) Find all fundamental circuits (cycles) and cutsets of the following graph G with respect to T.



Total No. of Questions : 5]

SEAT No. :

P3214

[Total No. of Pages : 3

[5541] - 21

M.C.A. - I (Science) (Semester - II)

COMPUTER SCIENCE

CS - 201 : Data & File 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.*
- 3) *All questions carry equal marks.*

**Q1)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Define linked list. Discuss its any three applications.
- b) Describe binary search tree and AVL tree with examples.
- c) What do you mean by graph traversal method? State them. Discuss any one with example.
- d) Write a function for bubble sort method.
- e) Describe primary & secondary indices in file organization.

**Q2)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Write an algorithm to evaluate a postfix expression.
- b) Differentiate static & dynamic memory allocation.
- c) Write recursive definition of any two tree traversal methods. Explain with suitable example.
- d) Define overflow. Explain any three overflow handling techniques.
- e) Differentiate clustered & non-clustered indices.

**P.T.O.**

**Q3)** Attempt any four of the following :

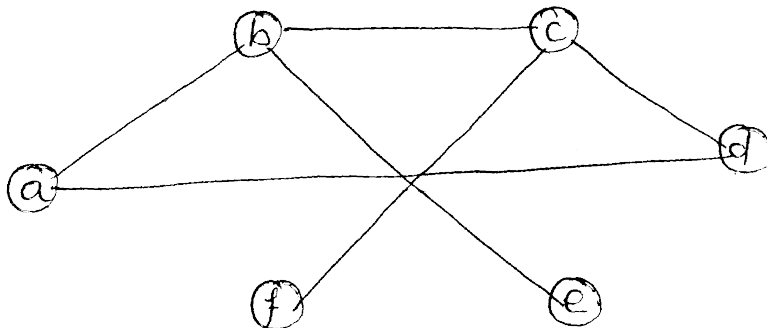
**[4 x 4 = 16]**

- a) Represent step-wise stack contents in recursive call to power (2, 5).
- b) Write a function to delete a node from a singly linked list.
- c) Define :
  - i) level
  - ii) father
  - iii) siblings
  - iv) left descendent
- d) Explain heap with its types.
- e) Define a file. Describe record with its types.

**Q4)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Describe circular queue and double ended queue.
- b) Write a function to delete a node from doubly circular linked list.
- c) Represent a given graph using adjacency matrix & adjacency list.  
Compute the degree of each node.



- d) Write a short note on ISAM.
- e) i) State any two uniform hash functions.
- ii) Convert the given infix expression to prefix & postfix expression.

[ $\$$ -power /exponent]

infix expression = ( ( P - (q + r) ) \*S) \$ ( t + u).

**Q5)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Describe in short Big on notation & sequences.
- b) Explain advantage of a circular queue over a linear queue with example.
- c) Write a function of create & display a stack dynamically.
- d) Write a function to insert a node in a circular queue.
- e) Apply merge sort on a given set of data to sort it in ascending order.

(20, 65, 55, 40, 15, 95, 85, 35).





Total No. of Questions : 5]

SEAT No. :

P3215

[Total No. of Pages : 4

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**M.C.A. (Science Faculty) (Semester - II)**  
**CS - 202 : THEORETICAL COMPUTER SCIENCE**  
**(2008 Pattern) (New)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Attempt any four of the following :

**[4 x 4 = 16]**

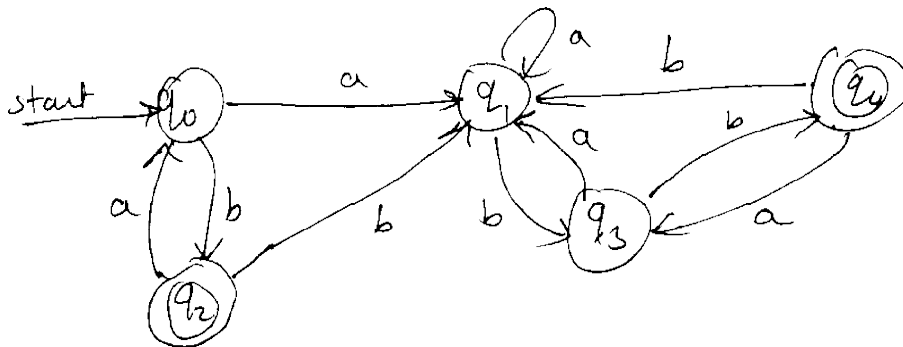
- a) Define :
  - i) Language.
  - ii) Proof of Induction.
- b) If  $A = \{a, b\}$  and  $B = \{b, d\}$ . Find
  - i)  $(A-B)^*$ .
  - ii)  $(A \cap B)^*$ .
- c) Construct NFA for language containing all strings over  $\{0, 1\}$  such that some two zero's are separated by a string, whose length is  $4i, i \geq 0$ .
- d) Construct DFA which accepts all strings having substring 'aba' in it over  $\{a, b\}$ .
- e) Write a regular expression for a language containing all possible combinations of 0's & 1's but not having two consecutive 0's.

**P.T.O.**

Q2) Attempt any four :

[4 x 4 = 16]

- Define Moore Machine. Design Moore machine to get 1's complement of a given binary string.
- Construct DFA for language whose strings are binary representation of numbers, multiples of 5 & starting with 1 to be accepted.
- Construct NFA -  $\epsilon$  for following  
 $1^* 0 + (0 + 11) 01^*$
- Construct minimal DFA for the following DFA.



- Prove that the regular sets are closed under complementation.

Q3) Attempt any four :

[4 x 4 = 16]

- Construct a CFG for the following language

$$L = \{a^n b^m c^n \mid n > 1, m > 0\}$$

- Define ambiguous grammar.
- Convert the following grammar into CNF.

$$S \rightarrow bA \mid aB$$

$$A \rightarrow bAA \mid aS \mid a$$

$$B \rightarrow aBB \mid bS \mid b$$

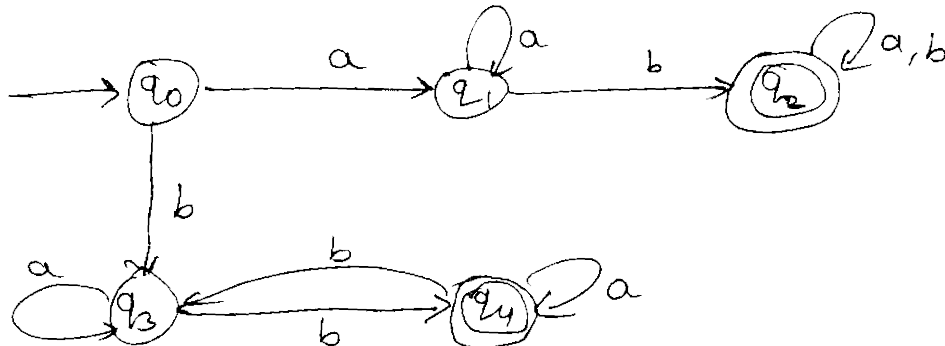
c) Convert the following CFG into GNF.

$S \rightarrow AB|B$

$A \rightarrow BS$

$B \rightarrow A1|11$

d) Construct regular grammar for DFA.



e) Design a PDA which accepts a language  $L = \{a^n b^{2n+1} | n \geq 1\}$ .

**Q4) Attempt any four :**

**[4 x 4 = 16]**

a) Construct a PDA that accepts language as  $S \rightarrow aS|aSbS|a$ .

b) Show that the CFL's are closed under union with an example.

c) Define :

i) Leftmost derivation.

ii) Reduction.

d) Construct PDA for language  $L = \{0^n 1^m 2^{n+m} | n, m \geq 1\}$ .

e) Construct CFG for the following

i)  $L = \{a^n b^m c^n | n, m \geq 1\}$ .

ii)  $L = \{a^n b^n | n \geq 1\}$ .

**Q5) Attempt any four :**

**[4 x 4 = 16]**

- a) Design a TM to accept  $L = \{ \omega \in \omega^R \mid \omega \text{ is in } (0 + 1)^* \}$ .
- b) Design TM for  $L = \{ a^m b^n \mid n \geq m, m > 0 \}$ .
- c) Explain whether palindrome problem can be solved by FA & PDA. Justify.
- d) Explain the Halting problem.
- e) Define LBA. State the difference between TM & LBA.



Total No. of Questions : 5]

SEAT No. :

P3216

[Total No. of Pages : 2

[5541] - 23

**M.C.A. (Under Science Faculty) (Semester - II)**  
**CS - 203 : Object Oriented Programming (C++ Programming)**  
**(2008 Pattern)**

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Explain the insertion and extraction operator in C++.
- b) Write short note on Procedural Programming Paradigm.
- c) List the basic concepts of object oriented programming. Explain any three.
- d) What are the rules for operator overloading?
- e) Explain static datamember and static member functions.

**Q2)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) In what sequence are the class constructors and destructors called when a derived class object is created. Explain with example.
- b) What is an exception? How are exceptions handled in C++?
- c) What is a file? Explain the various file stream classes needed for file manipulation.
- d) Write short note on Templates.
- e) What are iterators? Give the characteristic of Random iterator, Input iterator, forward.

**P.T.O.**

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

- a) Write a C++ program which consist of 2 base classes and one derived class  
base 1 : empno, empname  
base 2 : projno, projname  
derived : duration in days  
Display all information of employee.
- b) Create a class fraction to represent a fraction of type 2/5. Overload the arithmetic operators +, -, < on the objects of fraction.
- c) Write a program to declare a class having data members as hours, min & sec's write a friend function to add 2 timings. Use proper constructor and destructors.

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

- a) Write a C++ program which uses class template to multiply 2 no's of diff data types.
- b) Explain new & delete operators in C++.
- c) What is a virtual base class?
- d) What are copy constructors? Explain.
- e) Write a program in C++ to find the division of 2 numbers. Use exception handling for divide by zero error.

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

- a) Write a C++ program to read a file and count number of vowels and consonants in it.
- b) Write a program in C++ to find the area of circle rectangle and triangle. Use function overloading.
- c) What is an object? What is the difference between class and object?
- d) Explain public protected and private access specifier.
- e) Trace the output.

```
Class some {  
    ~some ( )  
    { cout << "some's destructor" << endl;}  
}  
void main ( )  
{ some S;  
  S. ~Some ( );  
}
```



Total No. of Questions : 5]

SEAT No. :

P3217

[Total No. of Pages : 3

[5541] - 24

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

CS - 205 : Database Management Systems

(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) *Neat diagrams must be drawn wherever necessary.*

**Q1)** Attempt all of the following :

**[8 x 2 = 16]**

- a) State the properties of transaction.
- b) Define the term schedule. Give one example.
- c) Explain 1NF.
- d) What do you mean by strong entity? Explain with one example.
- e) Define :
  - i) Primary key.
  - ii) Candidate key.
- f) What is deadlock?
- g) What are various types of lock?
- h) Define closure of a functional dependency.

**Q2)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Define & explain join types and join conditions in SQL.
- b) What is transaction? Explain different states of transaction.
- c) What is an aggregate function? Discuss various aggregate function with example.

**P.T.O.**

- d) Let R be a relational schema  
 $R = \{A, B, C, G, H, I\}$  and  
 $F = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow I, B \rightarrow I\}$   
 Let  $X = \{AG\}$   
 Compute  $(X)^+$  under F.
- e) State and explain Thomas-write rule with example.

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

- a) What are desirable properties of decomposition?  
 b) Explain different types of attributes with notation and example.  
 c) What are various problems that occurs in concurrent execution of transaction?  
 d) Explain deadlock prevention techniques.  
 e) Consider the following transactions. Find out any two non-serial schedules which are serializable to a serial schedule  $\langle T_1, T_2, T_3 \rangle$

$T_1$	$T_2$	$T_3$
read (a)	read (c)	read (a)
$a := a - 100$	$c := c * 10;$	$a := a + a * 0.12$
write (a)	write (c)	write (a)
read (b)	read (d)	read (c)
$b := b + 100$	$d := d - 1000$	$c := c + 1000;$
write (b)	write (d)	write (c)

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

- a) Discuss pattern matching operators in SQL with example.  
 b) Explain 2 phase locking protocol in detail.  
 c) Explain where clause and having clause in SQL in detail.  
 d) Explain the commands used for assigning priviledges to user and remove them from user with syntax and example.



- e) The following is the list of events in an interleaved execution of a set of transactions  $T_0, T_1, T_2$  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 register. Is there a deadlock instance? Justify your answer.

**Q5)** Attempt any four of the following :

**[4 × 4 = 16]**

- Define a view. State its purpose. Discuss with syntax for how to create and delete a view?
- What is recoverable and cascadeless schedule?
- What is query processing? Explain it with diagram.
- Consider the following relations.  
donar (d-id, d-name, addr)  
patient (p-id, pname, paddr)  
donar & patient are related to Many to Many relationship with descriptive attribute date of donation.
  - Normalize and design the database with necessary constraints.
  - Draw an  $\varepsilon$ -R diagram for the same.
- State responsibilities of DBA.



Total No. of Questions : 4]

SEAT No. :

P3218

[Total No. of Pages : 3

[5541] - 31

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

CS - 301 : 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.*
- 3) *Neat diagrams must be drawn wherever necessary.*
- 4) *Assume suitable data, if necessary.*

**Q1)** Attempt all of the following :

**[8 × 2 = 16]**

- a) Explain Big-oh ( $\theta$ ) & Omega ( $\Omega$ ) Notation to denote complexities.
- b) Give control abstraction for divide and conquer algorithm.
- c) What is prefix codes? Give one example.
- d) What is dominance principle in merge and purge?
- e) Define explicit and implicit constraints of 8 Queen Problem.
- f) What do you mean by branch and bound? Give an example of an application where this technique might be useful.
- g) Define strongly connected components with example.
- h) Define p-class and NP-class.

**Q2)** Attempt any four :

**[4 × 5 = 20]**

- a) Write and explain Dijkstra's algorithm.
- b) Sort the following elements using insertion sort algorithm by showing all phases. Also write complexity of insertion sort algorithm - 12, 3, 45, 2, 17, 72.

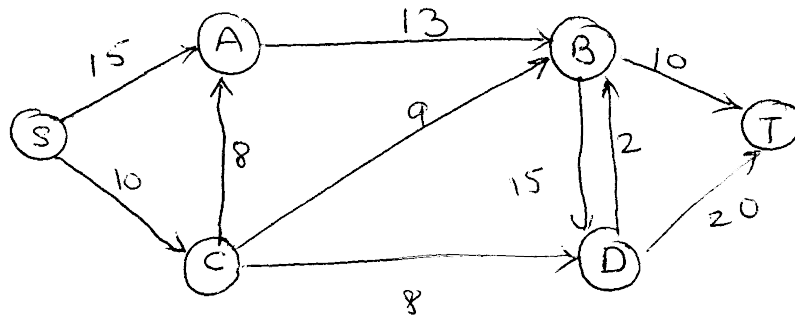
**P.T.O.**

c) What is an optimal Huffman code for the following set of frequencies?

Character	A	B	C	D	E	F	G
Frequency	9	30	5	16	20	16	5

d) Consider the following string and do encoding Also draw decode tree - "GO GO GOPHERS".

e) Find out the maximum flow from the network, where S is source and T is sink.



**Q3) Attempt any four :**

**[4 x 8 = 32]**

a) Derive the time complexity required by strassen's matrix multiplication. How the strassen's approach is different from ordinary matrix multiplication algorithm?

b) i) Find an optimal solution to the fractional knap-sack problem using greedy method.

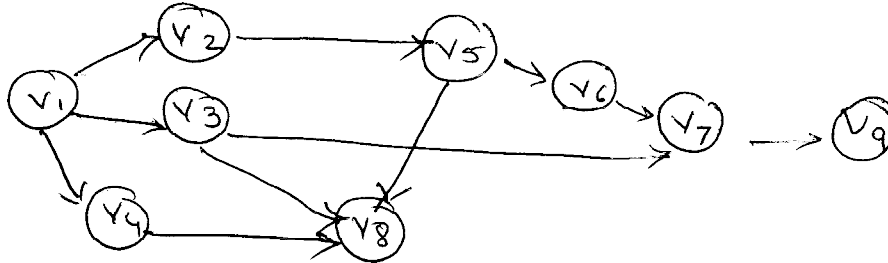
$$n = 4, m = 26, w = (12, 13, 9, 14), p = (15, 39, 18, 48).$$

ii) Which of the following sorting algorithms are stable Insertion, Merge, heap and quick sort? Give simple schema that makes any sorting algorithm stable.

c) Compute the path and cost of path for the following cost matrix of a travelling salesperson problem using

$$\angle_{cBB} \begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

- d) Let  $X = \text{abaabbaaaba}$  and  $Y = \text{abaababa}$ . Find minimum cost edit sequence that transforms  $X$  into  $Y$ .
- e) Explain topological sort algorithm for the directed graph. Illustrate it on following graph.



**Q4)** Attempt any three :

**[3 x 4 = 12]**

- a) Solve the following 0/1 knapsack problem using dynamic programming.  
 $n = 4, m = 18, w = (3, 8, 6, 4), p = (9, 10, 12, 9)$ .
- b) Explain graph colouring problem. Give explicit & implicit constraints for  $m$  - colouring problem.
- c) Write quick sort algorithm.
- d) Find an optimal placement for 8 programs on 3 tapes where programs are of lengths - 6, 31, 22, 26, 30, 9, 5, 3.
- e) What is an algorithm? Give its characteristics.



Total No. of Questions : 5]

SEAT No. :

P3219

[Total No. of Pages : 2

[5541] - 32

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

CS - 302 : COMPUTER NETWORKS

(2008 Pattern)

*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 indicates full marks.*

**Q1)** Attempt the all of the following :

**[8 × 2 = 16]**

- a) Give the disadvantages of star topology.
- b) Define port address.
- c) Define Bit rate and Baud rate.
- d) Define Latency.
- e) What is Polling?
- f) What are the different generations of Ethernet?
- g) What is the address space of IPV4 protocol.
- h) Define congestion.

**Q2)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Explain mesh topology with its advantages.
- b) Compare OSI & TCP/IP Model.
- c) What is framing? Explain physical layer coding violations.
- d) Construct a CRC message for the given polynomial  
 $x^{11} + x^{10} + x^9 + x^6 + x^5 + x^4 + x^2 + x^1$  and  
generator polynomial is  $x^5 + x^3 + x + 1$
- e) Explain extension headers of IPV6 protocol.

**P.T.O.**

**Q3)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Write a short note on fragmentation of IPV4.
- b) Differentiate FDMA, TDMA, & CDMA.
- c) Write a short note on un-guided media.
- d) Explain physical, logical & port addressing in layers.
- e) Define protocol. And explain key elements of it.

**Q4)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Explain the goals & applications of Computer Network.
- b) Explain VLAN.
- c) Write a short note on serial transmission.
- d) What is Shannon's capacity formula? Find out the maximum number of bits/seconds transmitted for channel of 6kHz bandwidth & signal to noise ratio is 50db.
- e) Explain transition strategies from IPV4 to IPV6.

**Q5)** Attempt any four of the following :

**[4 x 4 = 16]**

- a) Explain the address notations used to represent IPV4 address.
- b) Explain the difference between Bridged & Switched Ethernet.
- c) Explain CSMA/CD.
- d) Write a short note on selective repeat protocol.
- e) Explain different service primitives.



Total No. of Questions : 5]

SEAT No. :

P3220

[Total No. of Pages : 3

[5541] - 33

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

COMPUTER SCIENCE

CS - 303 : Introduction to System Programming &  
Operating System Concepts  
(2008 Pattern)

*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 indicates full marks.*

**Q1)** Attempt all of the following :

**[8 x 2 = 16]**

- a) What is the role of the dispatcher?
- b) Explain fork ( ) system call.
- c) What are two differences between user-level threads and kernel-level threads?
- d) Give two differences between logical and physical addresses.
- e) Give different attributes of file.
- f) Why are page sizes always power of 2?
- g) What is internal and external fragmentation?
- h) Define the term Bounded waiting.

**P.T.O.**

**Q2)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Consider the following processes with the CPU burst time and their arrival time. What is the average waiting time and turn around time for these processes with priority - scheduling algorithm?

Process	Burst - time	Priority
P <sub>1</sub>	10	3
P <sub>2</sub>	1	1
P <sub>3</sub>	2	4
P <sub>4</sub>	1	5
P <sub>5</sub>	5	2

- b) Explain the following directory structures
- Single - level directory.
  - Two - level directory.
- c) Explain how the recovery from deadlock is done?
- d) Explain different ways of free-space management.
- e) Explain the concept of linker and loader.

**Q3)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Consider the following reference string :
- 1, 2, 3, 4, 5, 3, 4, 1, 6, 7, 8, 7, 8, 9, 7, 8, 9, 5, 4, 5
- how many page faults will occur for following algorithms.
- LRU.
  - Optimum
- Number of frames = 4.
- b) What are the benefits of Multithreaded Programming?
- c) Write a short note on shared pages.
- d) Write a short note on resource-allocation graph.
- e) Explain in short the Readers - Writers problem.



**Q4)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Write a short note on fragmentation.
- b) Consider the following snapshot of a system.

Process	Allocation	Max	Available
	ABC	ABC	ABC
P <sub>0</sub>	010	753	332
P <sub>1</sub>	200	322	
P <sub>2</sub>	302	902	
P <sub>3</sub>	211	222	

Answer the following questions using Banker's algorithm.

- i) What is the content of matrix need?
- ii) Is the system in a safe state?
- c) Write a short note on semaphore.
- d) Explain the concept of paging with the help of the example.
- e) Write a short note on multilevel feedback Queue Scheduling.

**Q5)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Write a short note on system call.
- b) What is process? State and explain different process states.
- c) Explain the Dining-Philosophers problem.
- d) Explain the term swapping.
- e) Suppose a head of moving head disk with 200 tracks (0-199) is currently at track 50. 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.

- i) FCF5.
- ii) 55JF.



Total No. of Questions : 5]

SEAT No. :

P3221

[Total No. of Pages : 2

[5541] - 34

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

CS-305 : EVENT DRIVEN PROGRAMMING (Win 32 SDK)

*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 SDK program that is menu driven having following menu items and supporting specified functionality. (WinMain is not required and use ODBC APIs). **[12]**

Add - opens a dialog box to accept information (book-no, name, dealername, price). The record is inserted in the table "TblBook" when OK button is pressed & the no. of copies in the table "TblCopy" (book-no, no-of-copies) appropriately changed.

List-Displays in a list box, the names of all books in the table "TblBook". On selecting a particular book, a message box displays the no. of copies of that book.

Print-prints the list of books ordered by price.

**Q2)** Write program statements using Win32 APIs for any four of the following:

**[4 × 5 = 20]**

- a) Implement cut, copy, paste functionality.
- b) Add Vertical Scroll bar to a window and provide keyboard interface to it.
- c) Display Caret at top left position in client area, use arrow keys to move Caret left, right, up, and down one position.
- d) Define a push button of the size of the Client area. It should occupy the whole Client area, even when Window size is changed.
- e) Two threads, one thread displays H : at random position on the screen & second traces the mouse movement if it is dragged.

**P.T.O.**

**Q3) Answer in brief, any eight :**

**[8 x 2 = 16]**

- a) What is callback function?
- b) What is Caret? What is hotspot?
- c) Write message loop.
- d) What do you mean by Event driven programming?
- e) What do you mean by WINAPI?
- f) Differentiate : PSTR vs. LPSTR.
- g) What is hungarian notation?
- h) How to convert screen co-ordinates to Client Co-ordinates? And vice versa.
- i) What documentation is necessary for a DDE server program?
- j) How to create an edit box allowing multiple lines & ability to scroll?

**Q4) Justify : True/False (Any Six) :**

**[6 x 2 = 12]**

- a) Virtual memory size depends on available physical memory.
- b) WndProc is reentrant.
- c) Functionality of standard controls can be enhanced.
- d) WM-PAINT is a high priority message.
- e) GetAsyncKeyState performs a realtime keyboard status check.
- f) System menu can be modified.
- g) DLLs are always dynamically linked.
- h) An MDI Application is multithreaded.

**Q5) Attempt any Four :**

**[4 x 5 = 20]**

- a) Explain different APIs associated with Caret.
- b) Discuss memory management in Windows NT.
- c) Differentiate : Modal vs. modeless dialog box.
- d) Discuss any two synchronization objects in detail.
- e) Explain hot link DDE and cold link DDE in detail.



Total No. of Questions : 5]

SEAT No. :

P3222

[Total No. of Pages : 3

[5541] - 41

**M.C.A. (Under Science Faculty) (Semester - IV)**  
**CS-401 : Introduction to UNIX and UNIX Internals**  
**(2008 Pattern)**

*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) *Assume suitable data, if necessary.*
- 4) *All questions are compulsory.*

**Q1)** Attempt **all** of the following :

**[8 x 2 = 16]**

- a) What do you mean by processor execution level?
- b) What is environment variables? Show their usage.
- c) What are the contents of boot block?
- d) List any two time related system calls.
- e) What do you mean by shell meta-characters?
- f) What is the difference between named and unnamed pipe?
- g) What is the link count of a directory? Justify your answer.
- h) What do you mean by COW bit associated with page?

**Q2)** Justify True/False. Attempt **any four** :

**[4 x 4 = 16]**

- a) Device file inodes do not have Table of Contents.
- b) Process never calls system call directly.
- c) Text region and data region can be merged into one region.
- d) Pipe size changes with every read and every write.
- e) Kernel sometimes prevent the occurrence of interrupts during critical activity.

**P.T.O.**

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

- a) If a process wants to access byte offset 37775g in a file, find block number and byte offset in that block.
- b) Explain any two anomalies exist in the algorithm for the treatment of signals.
- c) Explain how protection fault is handled in demand paging system?
- d) 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?
- e) Explore the race condition for free buffer.

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

- a) Explain the behaviour of the following program.

```
#include <fcntl.h>

main ( )
{ int fd; char buf [1024]
  fd = creat ("xyz.txt", 0766);
  lseek (fd, 3000L, 2);
  write (fd, "hello", 5);
  close (fd);

  fd = open("xyz.txt", O-RDONLY);
  read (fd, buf, 1024);
  read (fd, buf, 1024);
  read (fd, buf, 1024);
}
```

- b) Write a C program where parent and child process share file.
- c) Write a shell script to print permission of a given file taken as command - line arguments.

- d) Explain the behaviour of the following program.

```
main (argc, argv)

int argc, char *argv [ ];

{   exec (argv [0], argc [0], 0);

}
```

- e) Write a C program which takes multiple file names as command line argument, and then prints its inode number.

**Q5) Attempt any four :**

**[4 x 4 = 16]**

- a) What is the context of a process? What are different situations under which kernel needs to save the context of a process.
- b) What are three different ways in which a process can respond 'death of child' signal?
- 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) Explain any two events for sleep that are sure to happen and one event that are not sure to happen.
- e) Explain the working of page stealer process.



Total No. of Questions : 5]

SEAT No. :

P3223

[Total No. of Pages : 2

[5541] - 42

M.C.A. (Science Faculty) (Semester - IV)

CS-402 : ADVANCED NETWORKING AND MOBILE COMPUTING

(2008 Pattern)

Time : 3 Hours]

[Max. Marks : 80

*Instructions to the candidates:*

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

**Q1) Attempt all :**

**[8 x 2 = 16]**

- a) What is cluster?
- b) Name the different architecture of Bluetooth.
- c) What is NVT?
- d) Name the different mode of operation in TelNet.
- e) Define acknowledgement number in TCP.
- f) Give any two use of UDP.
- g) What is active and passive hub?
- h) What is spread spectrum?

**Q2) Attempt any Four of the following :**

**[4 x 4 = 16]**

- a) Explain the 4<sup>th</sup> scenario of Email architecture.
- b) Explain the slow start mechanism.
- c) What are the requirements of Mobile IP?
- d) Explain the Bluetooth architecture.
- e) Write a short note on NSS of GSM.

**P.T.O.**

**Q3)** Attempt **any Four** of the following :

**[4 x 4 = 16]**

- a) Write a short note on web documents.
- b) Write the different services provided by SCTP.
- c) Explain the problems associated with reverse tunnelling.
- d) Write a short note on Direct Sequence Spread Spectrum.
- e) Explain the different teleservices in GSM.

**Q4)** Attempt **any Four** of the following :

**[4 x 4 = 16]**

- a) Write a short note on transparent bridge.
- b) Explain the different TCP features.
- c) Explain the IP packet delivery mechanism.
- d) Write a short note on hidden and exposed terminal problem.
- e) Write a short note on WAE.

**Q5)** Attempt **any Four** of the following :

**[4 x 4 = 16]**

- a) Write a short note on Anonymous FTP.
- b) Differentiate between UDP and TCP.
- c) Write the different applications of Mobile Networks.
- d) Write a short note on push architecture.
- e) Explain the handover scenarios.





Total No. of Questions : 4]

SEAT No. :

P3224

[Total No. of Pages : 3

[5541] - 43

M.C.A. (Science Faculty) (Semester - IV)

CS-403 : DISTRIBUTED DATABASE SYSTEMS

(2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Attempt the following :

**[8 × 2 = 16]**

- a) What is checkpointing?
- b) What is linear join tree and bushy join tree?
- c) What are :
  - i) Dirty Read.
  - ii) Non Repeatable Read.
- d) State different ways in which lock management is done.
- e) State the layers of query processing.
- f) What is nested transaction?
- g) Define the process of localization of distributed data involved in a query.
- h) What are correctness criteria for fragmentation?

**Q2)** Attempt any four :

**[4 × 5 = 20]**

- a) Write a short note on MDBS architecture.
- b) Explain in-place update recovery.
- c) Discuss Fix/Flush LRM algorithm.
- d) Explain 3 phase commit protocol.
- e) Explain top-down design process.

**P.T.O.**

Q3) Attempt any four :

[4 x 6 = 24]

a) Assume that relation Proj is fragmented as follows :

$$\text{Proj1} = \sigma_{\text{pno} \leq "P_2"}(\text{PROJ})$$

$$\text{Proj2} = \sigma_{\text{pno} > "P_2"}(\text{PROJ})$$

Further more relation Asg is indirectly fragmented

$$\text{Asg1} = \text{Asg} \alpha_{\text{pno}} \text{PROJ1}$$

$$\text{Asg2} = \text{Asg} \alpha_{\text{pno}} \text{PROJ2}$$

and relation Emp is vertically fragmented as

$$\text{Emp 1} = \Pi_{\text{eno}, \text{ename}}(\text{Emp})$$

$$\text{Emp 2} = \Pi_{\text{eno}, \text{title}}(\text{Emp})$$

Transform the following query into a reduced query on fragments.

select ename

from Emp, Asg, Proj

Where Proj. Pno = Asg. Pno

and Pname = "Instrumentation"

[Note for "Instrumentation" Pno = P1]

b) Transform the following query into optimised operators tree

Select Iname, Inv-no

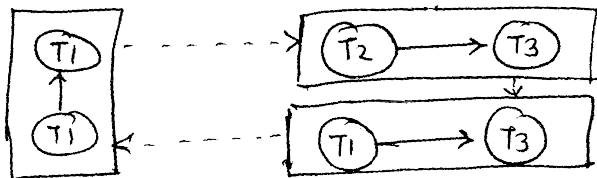
from in. amt > 50000

And Itn.itno = 1.itno

And (I. I name = "Grocery" OR Itn.query = 200) and

Int. In v-no = In.Inv-no

c) Consider the following DWIG given below



Detect the deadlock using distributed deadlock diagram.

- d) Let  $Q = \{q_1, \dots, q_5\}$  be a set of queries  
 $A = \{A_1, \dots, A_5\}$  be a set of attributes, and  
 $S = \{S_1, S_2, S_3\}$  be a set of sites. The Matrix (a) represents the attribute usage matrix and Matrix (b) represents access frequencies. Find the attribute affinity matrix.

Assume that  $\text{refi}(q_k) = 1 \forall q_k$  &  $S_1$  and  $A_1$  is the key attribute

	$A_1$	$A_2$	$A_3$	$A_4$	$A_5$		$S_1$	$S_2$	$S_3$
$q_1$	0	1	1	0	1	$q_1$	10	20	0
$q_2$	1	1	1	0	1	$q_2$	5	0	10
$q_3$	1	0	0	1	1	$q_3$	0	35	5
$q_4$	0	0	1	0	0	$q_4$	0	10	0
$q_5$	1	1	1	0	0	$q_5$	0	15	0
	(a)					(b)			

use bond energy & vertical fragmentation algorithms to obtain vertical fragmentation.

- e) Give the query graph for the following query, select ename, pname from emp, asg, plan where asg. duration < 72 and emp.no = asg.eno and emp.title = "supervisor" and asg. pno = plan.pno

**Q4) Attempt the following (any four) :** **[4 x 5 = 20]**

- a) How INGRES algorithm works?
- b) Write a note on different types of failures in DDBJ.
- c) Explain how normalization is done in query decomposition.
- d) Write a note on Basic to algorithm.
- e) Explain strict replica control protocols.



Total No. of Questions : 4]

SEAT No. :

P3225

[Total No. of Pages : 2

[5541] - 44

**M.C.A. (Science Faculty) (Semester - IV)**  
**CS-405 : 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.*
- 3) *Neat diagram must be drawn whenever necessary.*

**Q1)** Attempt the following :

**[8 × 2 = 16]**

- a) What is forward and reverse engineering?
- b) Differentiate between aggregation and association.
- c) Differentiate between user and Actor.
- d) “Collaboration is a society of roles and other elements” Justify True/False.
- e) “An object diagram is typically used to represent a scenario” Justify True/False.
- f) What are packages?
- g) What is Object Oriented Testing?
- h) Briefly explain phases in iterative object oriented development.

**Q2)** Attempt any four of the following :

**[4 × 8 = 32]**

- a) Draw usecase diagram and class diagram for On-line Railway Reservation System.
- b) Draw Collaboration diagram for ATM system.
- c) Draw state diagram and activity diagram for considering different scenarios for Ice-Cream vending machine.
- d) Draw component and deployment diagram for E-mail system.
- e) Draw sequence diagram and class diagram for social networking website (facebook/twitter) for searching specified contact over a Internet.

**P.T.O.**

**Q3)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Discuss different views supported by UML.
- b) How test cases are designed for Object Oriented Software?
- c) Explain the goals of UML.
- d) Explain the concept of Resource Management Component.
- e) Consider on automatic water level control system which is used for controlling the water flow. Identify the different states and draw state diagram.

**Q4)** Attempt any four of the following :

**[4 × 4 = 16]**

- a) Write short note on UP phases.
- b) What is Agile Modeling?
- c) Draw a sequence diagram for Library Management System.
- d) Draw a class diagram for management of savings account in a Banking system.
- e) Write a note on Generic Components of Object Oriented design model.



Total No. of Questions : 5]

SEAT No. :

P3226

[Total No. of Pages : 3

[5541] - 51

M.C.A. (Science Faculty) (Semester - V)

CS-501 : CRYPTOGRAPHY AND NETWORK SECURITY

(New) (2008 Pattern)

*Time : 3 Hours]*

*[Max. Marks : 80*

*Instructions to the candidates:*

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

**Q1)** Attempt **all** of the following :

**[8 × 2 = 16]**

- a) Explain the working of cookies.
- b) Using Simple Columnar transposition technique construct the cipher text of the following plain text. Assume number of columns = 6 and the order of columns is (4, 3, 2, 5, 6, 1)  
  
“UNIVERSITY OF PUNE LEADING UNIVERSITY”.
- c) What are the problems in Clear Text Passwords?
- d) Define : Cross Certification and Certificate Revocation List (CRL).
- e) List the different fields of X.509 authentication service.
- f) What are the limitations of Firewall?
- g) “A Trojan Horse allows an attacker to obtain some confidential information about a computer or a network” : Comment.
- h) FAR & FRR in biometric authentication are exactly opposite to each other : Comment.

**P.T.O.**

**Q2) Attempt any Four of the following :**

**[4 x 4 = 16]**

- a) What is virus? Write the steps to eliminate the virus.
- b) Explain following terms :
  - i) Cryptanalysis.
  - ii) Brute Force Attack.
  - iii) Encryption.
  - iv) Cryptography Techniques.
- c) What is firewall? What are the types of firewall?
- d) Write a short note on Secure Electronic Transaction (SET) process.
- e) What are the variations of triple DES, explain in brief.

**Q3) Attempt any Four of the following :**

**[4 x 4 = 16]**

- a) Write the characteristics of Cryptographic systems.
- b) Explain how RSA can be used to perform digital signatures?
- c) Compare Symmetric and Asymmetric key cryptography.
- d) Write short note on Dual homed host architecture.
- e) Write down the steps to verify digital certificates.

**Q4) Attempt any Four of the following :**

**[4 x 4 = 16]**

- a) Explain the conceptual working of DES. Explain the process of 56 bit key generation in DES.
- b) Explain in short.
  - i) Cross Certification.
  - ii) Certificate Revocation List.

- c) Explain the working of Certificate based Authentication.
- d) What functionalities are offered by S/MIME?
- e) Attempt the following :
  - i) Strength of IDEA.
  - ii) Define : Confusion and Diffusion.

**Q5) Attempt any Four of the following :**

**[4 x 4 = 16]**

- a) Consider the plain text.

“DOG”

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

“UNIVERSITY OF PUNE”

One time pad is QACDZMOUXGIJNVBP.

Using Vernam Cipher construct the Cipher text

- c) Apply Play Fair technique and convert the following plain text into cipher text. Plain text : MCA SEMESTER FIVE.
- d) Consider the values of  $n = 11$  and  $g = 13$ . Apply Diffie-Hellman Algorithm and generate keys  $K_1$  and  $K_2$ .
- e) Consider the plain text “10”. Let  $P = 13$  and  $Q = 7$ . 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. :

P3227

[Total No. of Pages : 2

[5541] - 52

**M.C.A. (Science Faculty) (Semester - V)**  
**INTERNET PROGRAMMING USING PHP**  
**(2008 Pattern)**

*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 carry equal marks.*
- 4) *Assume suitable data, if necessary.*
- 5) *All questions are compulsory.*

**Q1) Attempt All :**

**[8 × 2 = 16]**

- a) State the use of \$HTTP\_COOKIE\_VARS and \$HTTP\_GET\_VARS.
- b) What do you mean by Introspection?
- c) Give syntax of functions used to create and free a XML Parser.
- d) Write 2 uses of Cookies.
- e) What is the drawback of print-r function?
- f) Comment “echo statement is a language construct”.
- g) State the role of Web Server while executing PHP program.
- h) How to access global variables without using global keyword?

**Q2) Attempt any Four :**

**[4 × 4 = 16]**

- a) Explain any four built-in functions of strings.
- b) Explain garbage collection in PHP.
- c) Write a note on self processing form with suitable example.
- d) Give syntax of any four functions used in PHP to extract value from an array.
- e) Explain JSON responses in detail.

**P.T.O.**

**Q3) Attempt any Four :** **[4 × 4 = 16]**

- a) Write a PHP function to find union and intersection of two arrays.
- b) Write a PHP program to take directory name from user and displays all subdirectories in it.
- c) Write a PHP script to compare two strings.
- d) Write a PHP script to accept student's name and class on first page, makes in 4 subjects on second page and displays the name of the student and average marks on third page using cookies.
- e) Write a PHP script which creates 2 numbers as properties and defines a method Calc ( ) which prints the numbers to the browser.

**Q4) Attempt any Four :** **[4 × 4 = 16]**

- a) How to send an email from a PHP Script?
- b) Explain Client-Server model in detail.
- c) Explain various style sheets used in XML.
- d) Explain do-while and for each control structures with syntax.
- e) Explain POSIX and Perl Compatibility regular expressions in PHP.

**Q5) Attempt any Four :** **[4 × 4 = 16]**

- a) How security is achieved in PHP while handling uploaded files?
- b) State similarities and differences between associative and indexed arrays.
- c) Explain any four global arrays that contain EGPCS information.
- d) Explain various library functions provided by PHP to work with sessions.
- e) With proper explanation, specify what will be the output of the following program?

```
< ? php
```

```
$a = "C, C++, Java, PHP, C#";
```

```
$b = explode ( ' , ' , $a, 3);
```

```
echo "$b[2]";
```



Total No. of Questions : 5]

SEAT No. :

P3228

[Total No. of Pages : 2

[5541] - 53

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

COMPUTER SCIENCE

CS - 503 : Design Pattern

(2008 Pattern)

*Time : 3 Hours]*

*[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 the architectural pattern?
- b) State the elements of design pattern.
- c) State the benefits of proxy design pattern.
- d) Give the intent of Decorator design pattern.
- e) State the libilities of blackboard design pattern.
- f) What is the intent of Abstract Factory design 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 the design pattern? How design patterns are described?
- b) Explain pipes and filter architectural pattern.
- c) What are consequences of BlackBoard architectural pattern?
- d) Explain the steps to implement model view controller architectural pattern.
- e) Explain the benefits of Broker architectural pattern.

**P.T.O.**

**Q3)** Attempt the following (any four) :

**[4 × 4 = 16]**

- a) Write a note on organizing catalog of design pattern.
- b) State intent and consequences of single tone design pattern.
- c) Give in detail, participants of Abstract Factory design pattern.
- d) Explain the implementation issues of prototype design pattern.
- e) What are benefits and liabilities of Abstract Factory design pattern?

**Q4)** Attempt the following (any four) :

**[4 × 4 = 16]**

- a) Give the structure and participants of strategy design pattern.
- b) Explain the intent and consequences of Adapter Design pattern.
- c) What is the Decorator design pattern? What are the uses of it?
- d) Write a note on structure and benefits of proxy design pattern.
- e) Give the structure and participants of Decorator design pattern.

**Q5)** Attempt the following (any four) :

**[4 × 4 = 16]**

- a) Explain the collaborations of a observer design pattern.
- b) Explain the command design pattern with the help of structure and participants.
- c) Explain the participant and collaborations of command design pattern.
- d) Explain the Indented Control Flow style guide Idioms.
- e) Write a note on counted pointer Idiom.



Total No. of Questions : 5]

SEAT No. :

P3229

[Total No. of Pages : 2

[5541] - 54

M.C.A. - III (Science Faculty) (Semester - V)

COMPUTER SCIENCE

CS-505 : Software Testing & Quality Assurance

*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.*

**Q1)** Attempt **all** of the following :

**[8 × 2 = 16]**

- a) What is subsystem testing?
- b) Explain path coverage criteria.
- c) What is acceptance testing?
- d) What is boundary value analysis?
- e) Which are different testing tools available? Explain when each tool is used.
- f) Explain Indicator with eg.
- g) What is software review?
- h) Define process capability ratio.

**Q2)** Attempt **any Four** of the following :

**[4 × 4 = 16]**

- a) Explain six-sigma quality in detail.
- b) Explain Sampling Distribution.
- c) Write steps for constructing Scatter diagram.
- d) Explain Stastical Quality Assurance with diagram.
- e) Explain nature of errors.

**P.T.O.**

**Q3)** Attempt **any Four** of the following :

**[4 x 4 = 16]**

- a) Explain Testing Principles.
- b) What are the requirements of ISO 9001 standard?
- c) What is SQA plan?
- d) Explain importance of normalization value in software metrics.
- e) Explain Cocomo model.

**Q4)** Attempt **any Four** of the following :

**[4 x 4 = 16]**

- a) Explain complexity metrics.
- b) Explain major components of stastical methodology.
- c) Differentiate between measures & indicators. Define the term measurement.
- d) What are the advantages of cause and effect diagram?
- e) Explain testing in real time systems & testing GUI.

**Q5)** Attempt **any Four** of the following :

**[4 x 4 = 16]**

Write a short note on

- a) Pareto Analysis.
- b) Function Oriented Metrics.
- c) System Testing.
- d) Validation & Verification in SQA.
- e) Integration Testing.

