Total No. of Questions : 8] **SEAT No. :**

P3253 **[Total No. of Pages : 3**

[4738] - 1001
M.C.A. (Under Science Faculty)
CA - 101 : Programming with C
(2013 Pattern) (Semester - I)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt any five questions out of eight.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt each of the following :

a) Explain malloc ( ) and calloc ( ) function with example. **[4]**

b) Explain any four string manipulation functions with suitable example. **[4]**

c) Write down the use of conditional operator. **[2]**

Q2) Attempt each of the following :

a) What is the purpose of storage class? Explain automatic and static storage class with suitable example. **[4]**

b) Write a 'C' program to count number of words and number of lines in a given text file. The words are separated by one or more white spaces and lines are terminated by newline character. **[4]**

c) What will be the output of the following : **[2]**

```
main ( )
{
    printf ( );
}
    main ( )
{
    const int  i = 10;
    i = 20;
}
```

P.T.O.

Q3) Attempt each of the following.

a) Explain break and continue statement with an example. **[4]**

b) Write a 'C' program to accept a decimal number and convert it to equivalent binary number using user defined function. **[4]**

c) Explain the use of file opening modes "a" and "a+". **[2]**

Q4) Attempt each of the following.

a) Explain ftell ( ), rewind ( ) and fseek ( ) function with example. **[4]**

b) Write a 'C' program using structure to store information of players with the following attributes, name, no - of - innings, total - score, avg. Calculate the average score of each player and display information of all players in descending order of their average runs. **[4]**

c) What are limitations of an array? **[2]**

Q5) Attempt each of the following.

a) Explain the concept of formal and actual parameters with an example. **[4]**

b) Write a note on Bitwise operator. **[4]**

c) Write down the syntax for following functions used in graphics. **[2]**

i) rectangle

ii) ellipse

Q6) Attempt each of the following :

a) What is "Pointer to function"? Explain the concept with a program to find sum of two numbers? **[4]**

b) Write a 'C' program to merge two sorted array of m and n elements respectively into a third array. **[4]**

c) Write the output of following program. **[2]**

```
main ( )
{
    char *p = "abcd";
    printf ("%C", * pH);
    printf ("%C\\", *p);
}
```

Q7) Attempt each of the following :

a) Write an algorithm and draw a flowchart to check given number is a perfect number. **[5]**

b) Write a 'C' program for multiplication of two matrices. **[5]**

Q8) Attempt each of the following.

a) What are differences between structure and union? Explain with an example. **[5]**

b) Write a 'C' program using function to accept string and find out occurrences of the each vowels in it. **[5]**

♦♦♦♦

Total No. of Questions : 8] **SEAT No. :**

P3254 **[Total No. of Pages : 3**

[4738] - 1002
M.C.A. (Semester - I) (Science Faculty)
COMPUTER SCIENCE
CA - 102 : Database Management System
(2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Assume appropriate data if necessary.***
4) ***All questions carry equal marks.***

Q1) Attempt each of the following :

a) What is data independence? Explain the difference between logical and physical data independence with suitable examples. **[4]**

b) Explain different types of attributes in E-R diagram. **[4]**

c) What is deadlock? State any two prevention techniques of deadlock. **[2]**

Q2) Attempt each of the following :

a) Discuss pattern matching operators in SQL with examples. **[4]**

b) What are the disadvantages of file-oriented system? **[4]**

c) State the responsibilities of DBA. **[2]**

Q3) Attempt each of the following :

a) Consider the following relation schema : **[2 + 2 = 4]**

Account(branch_name, account_no, balance)

Customer(customer_name, cust_street, cust_city)

Branch(branch_name, branch_city, assets)

Solve following query using relational algebra :

i) Find those customers who live in Mumbai

ii) Find the largest account balance in the bank

P.T.O.

b) Consider the following transactions. Find out any two non-serial schedules which are serializable to a serial schedule <T1,T2,T3> **[4]**

T1	T2	T3
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)

c) State the properties of transaction. **[2]**

Q4) Attempt each of the following :

a) Consider the relational schema R(A,B,C,D,E) and F = {A->B, C->D, A->E}. Is the decomposition of R into R1 = (ABC), R2 = (BCD) & R3 = (CDE) lossless? Justify. **[4]**

b) Explain the concept of Multiple – Granularity locking. **[4]**

c) Define the terms : **[2]**

i) Schedule ii) Roll back

Q5) Attempt each of the following :

a) Explain Armstrong's axioms required to compute F^+. **[4]**

b) Explain group by and order by clause with example. **[4]**

c) Define : **[2]**

i) Primary Key ii) Candidate key

Q6) Attempt each of the following :

a) Every cascadeless schedule is also recoverable. Comment. **[4]**

b) What is timestamp ordering protocol? State Thomas Write rule. **[4]**

c) What is Query Language? State any two categories of it. **[2]**

Q7) Attempt each of the following :

a) What is RAID? Explain different levels of RAID. **[5]**

b) Write a short note on Buffer Management. **[5]**

Q8) Attempt each of the following :

a) Consider the following relations. **[5]**

Doctor(dno,dname,specialization)

Hospital(hospno, name, address)

Doctor and Hospital are related with many to many relation with attribute day-of-visit. Create a RDB for above and solve the following queries:

i) List the names of Doctors visiting 'Ruby Hall' on Monday.

ii) List the names of Hospitals in 'Pune' city, which has more than 10 doctors who are 'surgeon'.

iii) Delete all Doctors with specialization 'gynaec'.

b) Shown below is the log as it appears at three instances of time. Explain the recovery actions for immediate update scheme in each of case a, b, c. **[5]**

(a)	(b)	(c)
$<T_0$ start>	$<T_0$ start>	$<T_0$ start>
$<T_0$, A, 1000, 950>	$<T_0$, A, 1000, 950>	$<T_0$, A, 1000, 950>
$<T_0$, B, 2000, 2050>	$<T_0$, B, 2000, 2050>	$<T_0$, B, 2000, 2050>
	$<T_0$ commit>	$<T_0$ commit>
	$<T_1$ start>	$<T_1$ start>
	$<T_1$, C, 700, 600>	$<T_1$, C, 700, 600>
		$<T_1$ commit>

Total No. of Questions : 8] **SEAT No. :**

P3255 **[Total No. of Pages : 3**

[4738] - 1003

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

CA - 103 : MATHEMATICAL FOUNDATIONS

(2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Solve any five questions out of eight questions.***
2) ***Figures to the right indicate full marks.***
3) ***Use of non programmable scientific calculator is allowed.***

Q1) Attempt each of the following :

a) Let A and B be two sets. Show that $(A \cap B)^c = A^c \cup B^c$. **[4]**

b) Let $A = \{1, 2, 3\}, B = \{a, b\}$. Does there exist a on to function from set A to set B. Justify. **[4]**

c) Give an example of a symmetric relation which is not a reflexive relation. **[2]**

Q2) Attempt each of the following :

a) Let $f : \mathrm{R} \to \mathrm{R}, f(x) = x - 10$ and $g : \mathrm{R} \to \mathrm{R}, g(x) = 3x$. Find $(fog)(x)$ and $(fog)^{-1}(x)$. **[4]**

b) Let $A = \{x \in \mathrm{R} \mid x^2 + 2x + 1 = 0\}$ and $B = \{x \in \mathrm{R} \mid (x-1)(x+1) = 0\}$.
Find $A \times B$. **[4]**

c) Define partial order also give an example of a partial order on set of integers Z. **[2]**

Q3) Attempt each of the following :

a) Let $P(x)$ be the statement "student x knows calculus" and let $Q(y)$ be the statement "Class y contains a student who knows calculus". Express each of the following as quantifications of $P(x)$ and $Q(y)$: **[4]**

i) All students know calculus.

ii) Not every student knows calculus

P.T.O.

b) Show that $\forall x\,(P(x) \wedge Q(x))$ and $\forall x P(x) \wedge \forall x Q(x)$ are logically equivalent. **[4]**

c) Find a compound proposition involving propositions p, q and r that is false when p and q and r is true, but true otherwise. **[2]**

Q4) Attempt each of the following :

a) Give a proof by contradiction of the theorem "if n is an integer and $3n + 2$ is odd, then n is odd". **[4]**

b) Show that $\forall x P(x) \vee \forall x Q(x)$ and $\forall x(P(x) \vee Q(x))$ are not logically equivalent. **[4]**

c) Let $Q(x, y)$ be the statement $x + y = xy$. If the universe of discourse for both variables consists of all integers, what are the truth values, $Q(1,1)$ and $Q(2, 2)$? **[2]**

Q5) Attempt each of the following :

a) Find G. C. D. of polynomials $f(x) = x^3 - 2x^2 + 3x - 5, g(x) = x^2 + 3.$ **[4]**

b) Find all roots of $x^4 + 2x^3 - 12x^2 - 22x + 40 = 0$ where roots are in arithmetic progression. **[4]**

c) Use Remainder Theorem to find remainder when $x^4 - 3x^3 - 7x^2 - 2$ is divided by $x - 3$. **[2]**

Q6) Attempt each of the following :

a) Describe all solutions of $5x \equiv 4 (mod\, 7)$. **[4]**

b) Prove that if $a \equiv b (mod\ n)$ and $m \mid n$, then $a \equiv b (mod\ m)$. **[4]**

c) Find remainder of 4^8 when divided by 7. **[2]**

Q7) Attempt each of the following :

a) Let $\rho = \begin{bmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 \\ 4 & 5 & 3 & 2 & 1 & 7 & 6 & 8 & 9 \end{bmatrix}$ be a permutation. **[5]**

i) Write ρ as a product of disjoint cycles.

ii) Write ρ as a product of transpositions.

iii) Determine whether ρ is even or odd.

iv) Find order of ρ.

v) Find inverse of ρ.

b) Find GCD of 3587, 1819 and express it in linear combinations of 3587 and 1819. **[5]**

Q8) Attempt each of the following :

a) Solve the following system of equations by Guass elimination method.

$2x - y + 3z = 8, -x + 2y + z = 4, 3x + y - 4z = 0.$ **[5]**

b) Find inverse of the matrix $A = \begin{bmatrix} 1 & 2 & 1 \\ -1 & 0 & 2 \\ 2 & 1 & -3 \end{bmatrix}$ by adjoint method. **[5]**

Total No. of Questions : 8] SEAT No. :

P3256 [Total No. of Pages : 4

[4738] - 1004

M.C.A. (Under Science Faculty) (Semester - I)
CA - 104 : CONCRETE MATHEMATICS AND GRAPH THEORY
(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

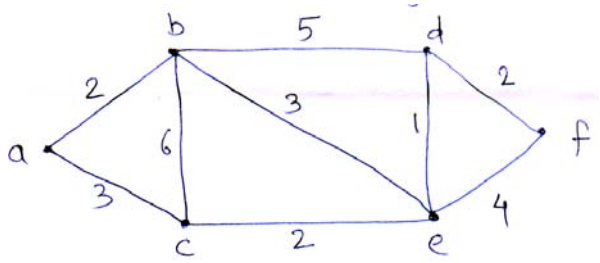
Instructions to the candidates:

1) ***Attempt any five questions out of eight.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Use of single - memory non - programmable scientific calculator is allowed.***

Q1) Attempt each of the following: **[4]**

a) Solve the following recurrence relation
$a_n - 2a_{n-1} - 3a_{n-2} = 0$ with $a_0 = 2$, $a_1 = 2$.

b) Using Prim's algorithm find minimal spanning tree of the following connected graph. **[4]**

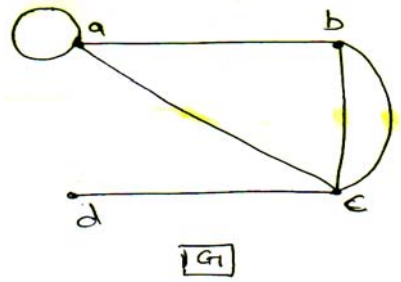


c) State max - flow min - cut theorem. **[2]**

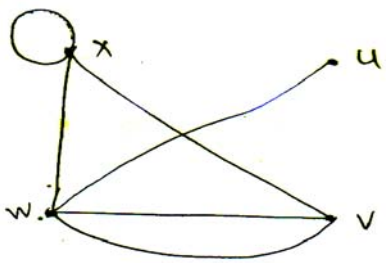
Q2) Attempt each of the following :

a) Find g.c.d. of 191 and 253. Also express it in the form 191.m + 253.n, where m,n $\in$ Z. **[4]**

b) Determine whether the following two graphs are isomorphic or not. **[4]**



G1



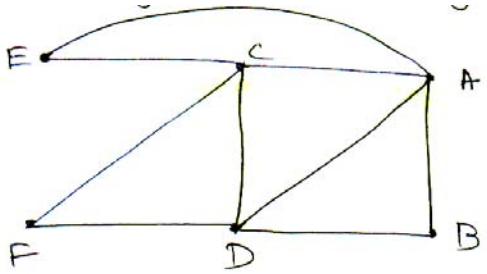
G2

P.T.O.

c) Draw a 3 - regular graph on 8 - vertices. **[2]**

Q3) Attempt each of the following.

a) Using Fleury's algorithm find Euler tour in the following connected graph. **[4]**



b) Draw the arboresence corresponding to the following expression and write the polish notation. **[4]**

$$a + b - \frac{c \cdot d}{g^x - f}$$

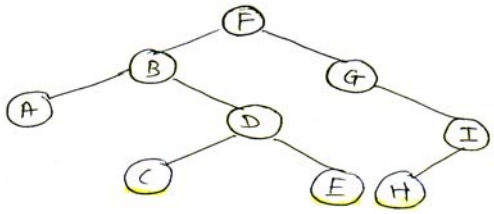
c) Draw a graph whose adjacency matrix is given below. **[2]**

	a	b	c	d
a	1	1	0	0
b	1	0	2	1
c	0	2	1	0
d	0	1	0	1

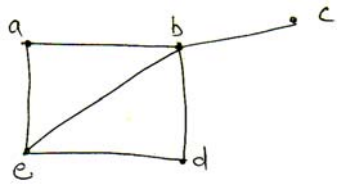
Q4) Attempt each of the following :

a) State and prove Euler's theorem for connected planar graph. **[4]**

b) Obtain preorder and postorder traversal for the following binary tree. **[4]**



c) Fuse the vertices a and b **[2]**



Q5) Attempt each of the following.

a) Define **[4]**

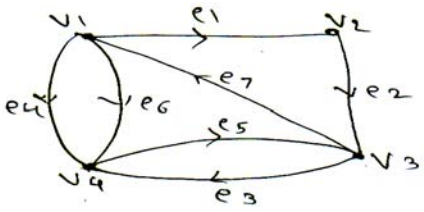
i) Planar graph

ii) Chromatic number

give example of each

b) Find the remainder when $7^{200} + 11^{800}$ is divided by 101. **[4]**

c) Draw any two directed walks from vertex v_1 to v_3 in the following graph. **[2]**



Q6) Attempt each of the following.

a) Find perticular solution of the following recurrence relation. **[4]**

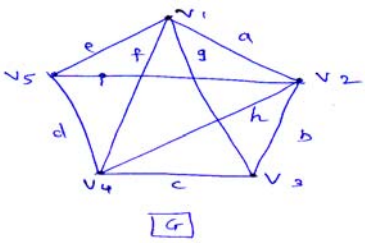
$a_n - 4a_{n-2} = 3n$

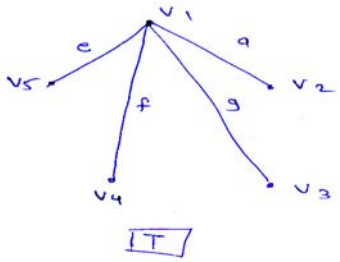
b) Prove that a tree on n - vertices has (n – 1) edges. **[4]**

c) Find inverse of 3 modulo 7. **[2]**

Q7) Attempt each of the following.

a) Find the fundamental circuits of graph G w.r. to tree T. **[5]**



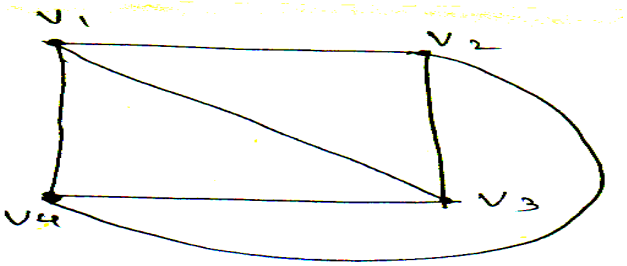


b) Encrypt the message 'HERE IS A MESSAGE' using a Caeser cipher. **[5]**

Q8) Attempt each of the following. **[5]**

a) Explain RSA - cryptosystem.

b) Determine the chromatic number of the following graph and find its chromatic polynomial. **[5]**



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Total No. of Questions : 8]

SEAT No. :

P3257

[Total No. of Pages : 3

[4738] - 1005

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

COMPUTER SCIENCE

CA - 105 : Computer Organization

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Figures to the right indicate full marks.***
3) ***Draw neat diagrams wherever necessary.***

Q1) a) Draw block diagram of 8086 microprocessor. Explain function of B1U and EV. **[4]**

b) Explain 3-bit synchronous up counter with suitable logic diagram. **[4]**

c) Define the following related to memory: **[2]**

i) hit ratio

ii) mis ratio

Q2) a) Draw symbols and write truth tables of following logic gates: **[4]**

i) NOT

ii) OR

iii) AND

iv) EXOR

b) Draw diagram and explain dual slope ADC. **[4]**

c) Write functions of the following registers in microprocessor: **[2]**

i) MAR

ii) MBR

P.T.O

Q3) a) Explain synchronous serial data communication with its data format. **[4]**

b) What are the advantages of parallelism ? Classify the parallel processing based on instruction and data stream. **[4]**

c) State features of 8086 microprocessor. **[2]**

Q4) a) Implement the following function using 8:1 multiplexer: **[4]**

$F [A,B,C,D] = \sum (0,1,3,4,8,9,15)$

b) What is stack ? Explain function of stack pointer. **[4]**

c) State the parallel computer structures. **[2]**

Q5) a) Explain the concept of arithmetic pipeline. **[4]**

b) Draw logic diagram of 1:4 demultiplexer and explain its working. **[4]**

c) state the function of following registers in microprocessor: **[2]**

i) Program Counter

ii) Flag register

Q6) a) Write a note on virtual memory. **[4]**

b) Draw diagram and explain working of 4 bit R-2R ladder network. **[4]**

c) Simplify the Boolean expression: **[2]**

$(A + B) (A + C)$

Q7) a) Explain the block diagram of parallel interface. **[5]**

b) Explain concept of paging and segmentation in memory management. **[5]**

Q8) a) Design an automatic car alarm circuit which detects seat belts, head lights, ignition and door. **[5]**
Consider the following conditions to switch on the alarm.

i) If ignition is OFF and headlights are ON.

ii) The door is open and ignition is ON.

iii) The seat belts are not fastened when ignition is ON.

b) Compare RISC and CISC architectures **[5]**

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Total No. of Questions : 5]

SEAT No. :

P3233

[Total No. of Pages : 4

[4738] - 101

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

COMPUTER SCIENCE

CS - 101 : C Programming

(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 indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt the following:

a) Trace and justify output (Any Two): **[2 x 4 = 8]**

i) enum values (a, b = 5, c, d = 6);

```
Main ( )
   { Char s[15] = "international";
     print f ("% d \ n % d \ n", strlen (s),
                                  sizeof (s));
     print f (" % d % d % d % d", a, b, c, d);
```

ii)

```
Main ( )
   {int x = 5, y = 5, i;
    for (i = 0; i < 3; i + +)
     {  change (x, & y)
        printf ("% d \ t % d \n", x, y);
     }
void change (int a, int *b)
     { a = * b + = 3}
```

P.T.O.

iii) Main ( )

```
{  int i = 3, *j = & i;
   print f (" % d \ n", i * * j * i + *j);
}
```

b) Find out error and explain (Any Two): **[2 x 4 = 8]**

i) Main ( )

```
{  struct abc;
    {  int   i;  }
   abc A;
   A. i = 25;
   Printf ("% d", A – i);
```

ii) Main ( )

```
{  int   i = 2;
   # def DEF
      i * = i;
   # elseif
         printf ("2n% f", i);
   # end if;
}
```

iii) Main ( )

```
{  int a [ ] = (2, 4, 6, 8)
   int i = 0;
   for (i < = >; i + +);
    {     * (i + a) = a (i) + + ;
          printf ("\n % d", i (a)) ;
    }
}
```

Q2) Attempt the following (Any Four): **[4 x 4 = 16]**

a) Explain different forms of 'if' statement with example.

b) What is format specifier? List any six format specifiers with its usage.

c) What is storage class? Differentiate static and automatic storage class with example.

d) What is dynamic memory allocation? Explain different functions used for dynamic memory allocation.

e) What are different types of files? Explain any six file input, output functions.

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

a) Write a C program to read 'n' numbers and print a number whose addition of digits is maximum.

b) Write a C program to find prime factors of a given number.

c) Write a C program to find GCD of two numbers using recursive function.

d) Write a C program to print sum of two matrices.

e) Write a C program using structure to read roll no, names of 'n' students and display the data in descending order of roll nos.

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

a) Explain any two bitwise operators.

b) What is preprocessor? Explain conditional compilation directive.

c) Differentiate between increment and decrement operator with example.

d) What is an array? What are the limitations of an array?

e) Explain any four library functions used with string.

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

a) Write a C program to accept two strings from command promt and print concatenation of two strings.

b) Write a C program to count number of words and lines in a given text file.

c) Write a C program to convert decimal number to binary number.

d) Write a C program to demonstrate functionality of 'strlen ( )' function.

e) What is pointer? Explain pointer arithmatic with example.

Total No. of Questions : 5] SEAT No. :

P3234 [Total No. of Pages : 2

[4738] - 102
M.C.A. (Science) (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) Draw the logic diagram of J.K flip-flop using NAND gates. Give its truth table.

b) Differentiate between hardware and software interrupts.

c) Compare the features of ISA and EISA bus.

d) Explain concept of parallel computer structure.

e) Which are the enhanced features included in pentium processor over 80486 processor.

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

a) Draw the circuit for 4-bit R-2R ladder DAC. Explain its working. Find the output for digital inputs 1011 and 1000 if the v_{ref} = 4volt.

b) Draw block diagram of Inter-math Co-processor and explain its "Numeric Execution Unit".

c) What is concept of pipeline. Explain 4 segment instruction pipeline.

Q3) Attempt <u>any four</u> : **[4 × 4 = 16]**

a) Draw logic diagram of 3bit adder. Explain its working.

b) Distinguish between real mode and protected mode operations of microprocessor.

c) Give the features of PCI bus.

d) Draw logic diagram of 1:4 DMUX and explain its working.

e) Explain asynchronus serial communication with it data format.

P.T.O.

Q4) Attempt <u>any four</u> : **[4 × 4 = 16]**

a) Define following parameters of ADC

i) Resolution ii) Accuracy

iii) Monotonocity iv) Conversion time

b) Draw logic diagram of 3bit asynchronus up counter and explain its working.

c) Draw block diagram of I/O interface. Explain function of timing and control unit.

d) Explain register addressing and Index addressing mode with suitable example.

e) Compare RISC and CISC Architecture.

Q5) Attempt <u>any two</u> : **[2 × 8 = 16]**

a) Draw block diagram of programmable peripheral interface IC 8255 and explain working of each block.

b) What is shift register. Draw logic diagram of 4bit universal shift register and explain PISO and SISO mode.

c) i) Write short note on RISC pipeline.

ii) List different general purpose registers in pentium processor. Explain the role of each.

Total No. of Questions : 5]

SEAT No. : ____

P3235

[Total No. of Pages : 3

[4738] - 103

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

CS - 103 : Mathematical Foundations

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) ***Use of non-programmable scientific calculator is allowed.***

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

a) If A is set of all rational numbers and B is set of all irrational numbers then find

i) $A \cap B$

ii) $A \cup B$

iii) $A - B$

iv) $(A \cup B) - (A \cap B)$

b) If $A = \{1, 2, 3, 4\}$, $B = \{1, 2\}$ find $(A \times B) \cap (B \times A)$.

c) Let f_1 and f_2 be functions from R to R (set of real numbers to itself) such that $f_1(X) = X^2$, $f_2(X) = X - X^2$. What are the functions $f_1 + f_2$ and $f_1 \cdot f_2$?

d) Let $A = Z^+$, the set of positive integers, and let $R = \{(a, b) \in A \times A / a$ divides $b\}$. Is R symmetric? Is R antisymmetric? Justify your answer.

e) A survey has been taken on methods of commuter travel. Each respondent was asked to check BUS, TRAIN, or AUTOMOBILE as a major method of travelling to work. The result reported were as follows :
BUS, 30 people; TRAIN, 35 people; AUTOMOBILE, 100 poeple; BUS and TRAIN, 15 people. BUS and AUTOMOBILE, 15 people; TRAIN and AUTOMOBILE, 20 people; and all the three methods, 5 people. How many people completed a survey form?

P.T.O.

Q2) Attempt <u>any four</u> of the following : **[16]**

a) Using Mathematical induction to prove that $1 + 2 + 2^2 + \ldots\ldots\ldots\ldots + 2^n = 2^{n+1} - 1$ for all non negative integers n.

b) If the time now is 4 o' clock what time will it be 101 hours from now and 503 hours from now?

c) If g.c.d (a, b) = d then prove that g.c.d. (a/d , b/d) = 1.

d) Find remainder when 2^{2012} is divided by 7.

e) Let n > 0 be fixed and a, b, c, d be arbitrary integers; then prove that

i) $a + c \equiv b + d \pmod{n}$

ii) $ac \equiv bd \pmod{n}$

Q3) Attempt <u>any four</u> of the following : **[16]**

a) Determine whether the set of integers together with the binary operation a * b = a + b – ab is semigroup or monoid or neither.

b) Prove that $U(8) = \{\bar{1}, \bar{3}, \bar{5}, \bar{7}\}$ is a group with respect to the operation multiplication modulo 8 (X_8).

c) For the matrices. $A = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 4 & 5 \\ -3 & 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & -3 \\ 2 & 4 & 0 \\ 3 & 2 & 1 \end{bmatrix}$

Prove that $(A \cdot B)^T = B^T \cdot A^T$.

d) Find inverse of a matrix 'A' by adjoint method, where $A = \begin{bmatrix} 1 & 3 & 0 \\ 2 & 2 & 1 \\ 1 & 0 & 1 \end{bmatrix}$.

e) Solve the system of linear equations by inverse method.

$4x + 6y = 1$

$10x + 2y = 1$

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

a) Prove the following statement by method of contradiction.

"If n is an integer and n^2 is odd, then n is odd."

b) Let Q (x, y) denote the statement $x = 2y + 3$. What are the truth values of the propositions Q (1, 0) and Q (3, 1)?

c) Use truth table to verify the equivalence $p \vee (p \wedge q) \equiv P$.

d) Show that $\sim (p \vee (\sim p \wedge q))$ and $\sim p \wedge \sim q$ are logically equivalent.

e) Using quantifiers symbolize the following : If the universe of discourse is the set of real numbers.

i) There is some x such that $x^2 - 10x + 25 = 0$.

ii) For every real number x, x^2 is always non-negative.

iii) For any value $x(\neq 0)$, there is some value y such that $x \cdot y = 1$.

iv) There is a value of x and y such that $x^2 + y^2$ is negative.

Q5) Attempt <u>any two</u> of the following : **[16]**

a) Let A = {1, 2, 3 ,4, 5, 6, 7, 8} and

$$\sigma = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 4 & 2 & 1 & 6 & 5 & 8 & 7 & 3 \end{pmatrix}$$

$$\tau = \begin{pmatrix} 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\ 7 & 3 & 4 & 2 & 1 & 8 & 6 & 5 \end{pmatrix}$$

Find i) $\sigma \, 0 \, \tau$

ii) $\sigma^{-1} \, 0 \, \tau^{-1}$

iii) Express σ and τ as a disjoint cycle form.

iv) Determine whether $\sigma^{-1} 0 \, \tau$ is even permutation or odd.

b) Find g.c.d of $f(x) = 3x^3 + 6x^2 + 3$ and

$g(x) = 3x^4 + 9x^3 + 6x^2 - 3x + 9$ and find $m(x)$ and $n(x)$ such that $m(x) \cdot f(x) + n(x) \cdot g(x) = g.c.d\,(f(x), g(x))$.

c) Find the solution for the following system of linear congruences.

$2X \equiv 1 (\mathrm{mod}\, 3)$

$2X \equiv 1 (\mathrm{mod}\, 5)$

$4X \equiv 1 (\mathrm{mod}\, 7)$

● ● ●

Total No. of Questions : 5] **SEAT No. :**

P3236 **[Total No. of Pages : 4**

[4738] - 104
M.C.A. (Part - I) (Under Science Faculty)
MATHEMATICS
CS - 105 : Graph Theory
(2008 Pattern) (Semester - I)

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

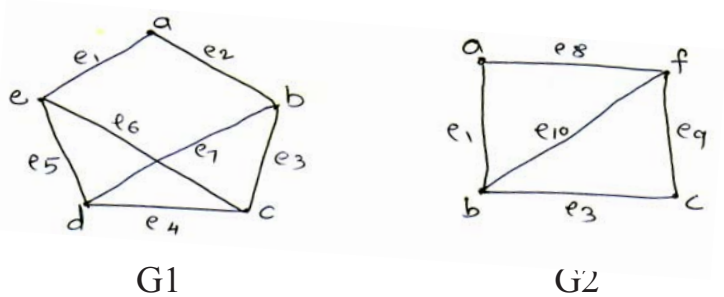
Instructions to the candidates:

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

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

a) For the following graphs G1 and G2 find

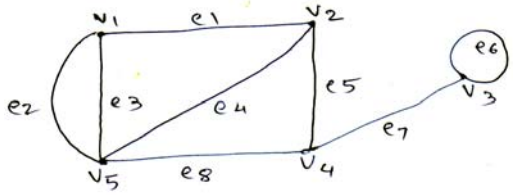
i) G1 ∪ G2 ii) G1 ∩ G2



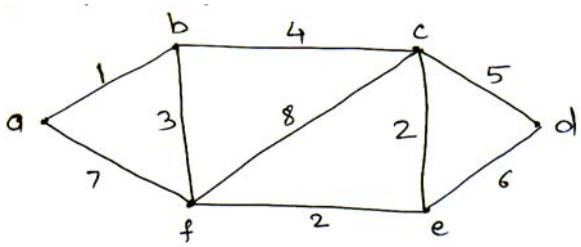
G1 G2

b) Prove that if e is isthmus of G then e belongs to every spanning tree of G.

c) Find the incidence and adjacency matrix of the following graph.



d) Using Kruskal's algorithm find the minimum weight spanning tree.



P.T.O.

e) Solve the recurrence relation.

$a_r + 7a_{r-1} + 10\, a_{r-2} = 0$ with $a_0 = 10$, $a_1 = 41$

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

a) Draw the arborescence and express in polish notation

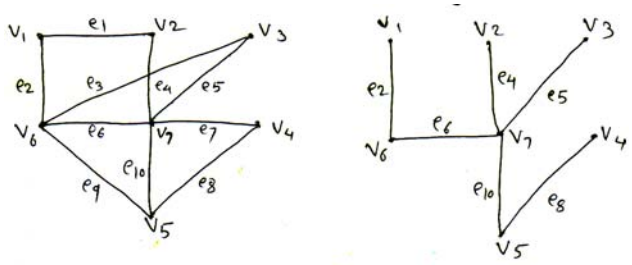
$$\frac{(3x+y)}{(6a-3b)^4}$$

b) Draw the following graph

K(G) = 1, $\lambda(G) = 2$, $\delta(G) = 3$

Justify your answer.

c) Find the fundamental cycles of the following graph G with respect to spanning tree T



G T

d) If G is self complementary graph on n vertices then show that n is of the type 4k or 4k + 1 for some integer k.

e) Solve the recurrence relation using generating functions.

$a_n = 3a_{n-1} + 2$, $n \geq 1$ with $a_0 = 1$

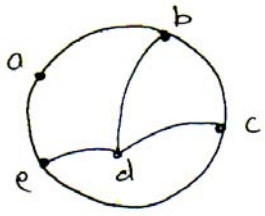
Q3) Attempt any four of the following. **[16]**

a) Define

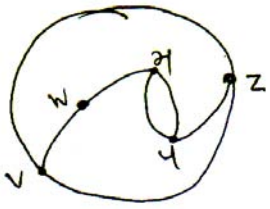
i) Complete asymmetric digraph

ii) Hamiltonian graph

b) Find whether the following graphs are isomorphic or not. Justify.



G_1



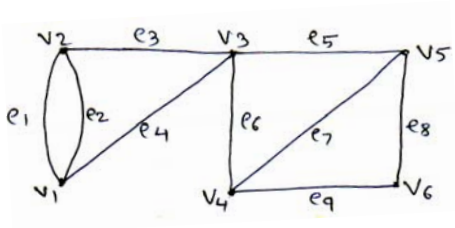
G_2

c) Write Dijkstra's algorithm to find shortest path.

d) For the following graph, find

i) G - S, where S = $\{e_1, e_2, e_8, e_9\}$

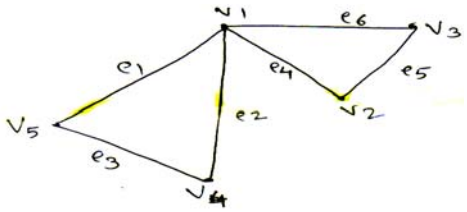
ii) G - F, where F = $\{v_1, v_2, v_5, v_6\}$



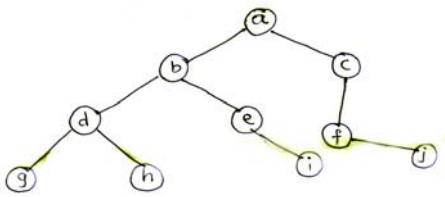
e) Let T is graph on P vertices and q edges. If T is a cyclic and q = p - 1 then T is connected.

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

a) Fuse the vertices v_1 and v_3



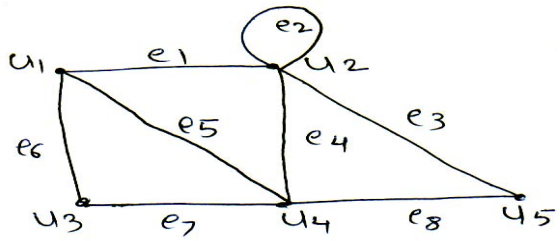
b) Obtain preorder and postorder traversal for the following tree.



c) Graph G has n vertices and n–1 edges. Prove that G has either a vertex of degree one or an isolated vertex.

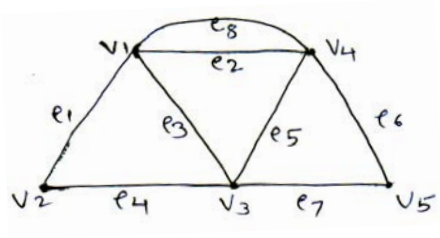
d) Find the maximum height and minimum height of binary tree on n vertices.

e) Find all possible paths from u_1 to u_5. Also find their length and distance between u_1 and u_5



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

a) Using Fleury's algorithm find Eulerian circuit in following graph G.



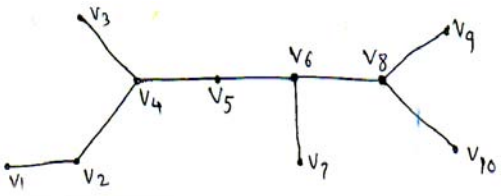
b) Draw all non-isomorphic trees on 6 vertices.

c) State true or false with justification

i) There exists a 5 - regular graph on q vertices

ii) Every complete bipartite graph is complete graph

d) Find eccentricities of all vertices. Hence find centre and radius of the graph.



e) A connected graph G with p vertices and p – 1 edges is tree.

Total No. of Questions : 8] SEAT No. :

P3258 [Total No. of Pages : 3

[4738] - 2001
M.C.A. - I (Science Faculty) (Semester - II)
COMPUTER SCIENCE
CA - 201 : Data Structures
(2013 Pattern)

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

Instructions to the candidates:

1) ***Attempt any five questions out of eight.***
2) ***All questions carry equal marks.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) Attempt all of the following:

a) List different operations on queue. Write 'C' function to insert and delete element from queue. **[4]**

b) Evaluate following postfix expression using stack (Give steps for evaluations) **[4]**

PQ + RS – *

Consider P = 9, Q = 8, R = 7, S = 4.

c) What is the difference between ADT, data type and data structure? **[2]**

Q2) Attempt all of the following :

a) Create Maxheap for the following elements show all steps of creation.

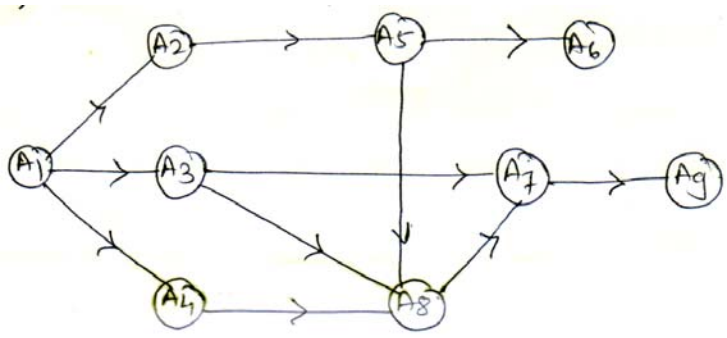
32, 15, 64, 2, 75, 67, 57, 80. **[4]**

b) Compare data structures used to create singly linked list, doubly linked list and circular list. Explain with the help of example. **[4]**

c) Explain the different traversal methods with example. **[2]**

Q3) Attempt all of the following :

a) Find topological ordering for the following graph. **[4]**



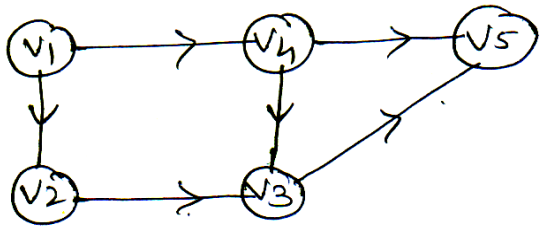
P.T.O.

b) Write a 'C' function for the following.

i) Display circular linked list

ii) Delete a node from circular linked list. (position of node = last node). **[4]**

c) Find the adjacency list for the following graph. **[2]**



Q4) Attempt all of the following:

a) Sort following data using insertion sort. (show all iterations.)

Mar., Aug., Nov., Feb., Sept., Dec. **[4]**

b) Define hash function. Explain how the hash function is chosen. **[4]**

c) Show that $f(x) = O(x^3)$ where

$f(x) = 5x^3 + 6x^2 + 1$ **[2]**

Q5) Attempt all of the following :

a) Explain graphically, various situations to insert an item to singly linked list. (Assume suitable data). **[4]**

b) Write output for the following program segment. Show contents of queue after every insert & delete operation. **[4]**

```
initQueue (Q);
Insert (Q,6);
Insert (Q,10);
I = Delete (Q);
While (I > o )
{ insert (Q, I*I)
      I – – ;
}
Insert (Q, I * 5);
While (! Queue empty (Q))
Print f ("%.d",  Delete (Q));
```

c) Explain with example big oh (O) notation. **[2]**

Q6) Attempt all of the following :

a) Write 'C' function to convert infix expression to prefix expression. **[4]**

b) Each element of an array A [10] [20] requires 4 byte of storage. Base address of data = 1000.

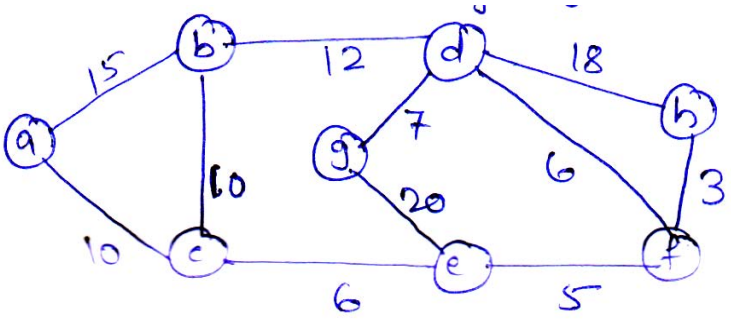
Determine the location of element A [5] [10] when array is stored as -

i) Row major ii) Column major **[4]**

c) Define i) Linear data structure ii) Non - linear data structure **[2]**

Q7) Attempt all of the following :

a) Consider the following weighted graph. Find the shortest path & shortest distance from vertex 'a' to vertex 'h' using Dijkstra's algo. **[5]**



b) Construct AVL tree for following data **[5]**

Sun., Fri., Mon., Wed., Tue., Thur., Sat.

Q8) Attempt all of the following :

a) Write a 'c' function to evaluate a polynomial. **[5]**

b) Construct BST for following data. Show all steps **[5]**

Insert (25, 6, 36, 9, 12, 18, 30, 33).

Delete (9, 6)

Total No. of Questions : 8]

SEAT No. :

P3259

[Total No. of Pages : 4

[4738] - 2002

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

CA - 202 : Theoretical Computer Science

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

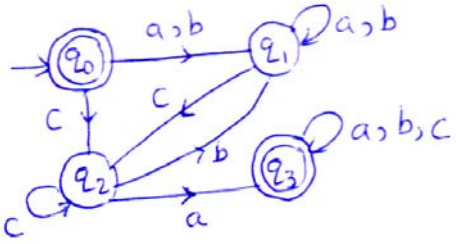
Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***All questions carry equal marks.***
4) ***Attempt any 5 of the following 8 questions.***

Q1) Attempt All.

a) Construct DFA over {0, 1} if it starts with '0' then accept even length strings and if starts with '1' then it must accept odd length strings. **[4]**

b) Construct Regular grammar for given DFA. **[4]**



c) State True or False and Justify your answer. Context-sensitive language is by default phrase structure language. **[2]**

Q2) Attempt All.

a) Convert the following grammar into CNF. **[4]**

$S \rightarrow bA / a\ B$

$A \rightarrow bAA / aS / a$

$B \rightarrow aBB / bS / b$

b) Construct Turing Machine for $L = \{a^n b^m c^{n+m} / n \geq 0\}$. **[4]**

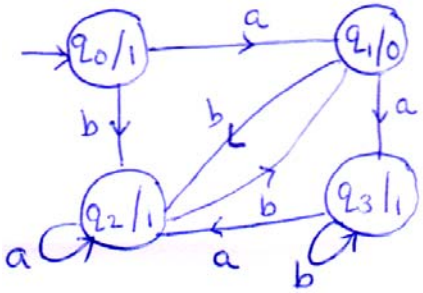
c) Give Regular expression and construct NFA for all strings over {0, 1} having substring '00'. **[2]**

P.T.O.

Q3) Attempt All.

a) Construct PDA for $L = \{a^n b^m c^{n+2} / n, m \geq 1\}$. **[4]**

b) Construct Mealy Machine for the following Moore Machine. **[4]**



c) Define Nullable Non-terminals. Find the Nullable Non-terminals for the following grammar. **[2]**

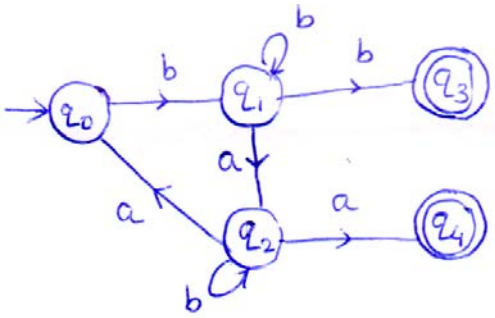
S → ABA

A → SA / B / bB

B → aA / b / ∈

Q4) Attempt All.

a) Construct DFA for the following NFA. **[4]**



b) Convert the following grammar into GNF. **[4]**

S → AB / B

A → BS

B → AS / 1

c) Define Linear Bounded Automata. **[2]**

Q5) Attempt All.

a) Check whether $L = \{a^n b^{2n} / n \geq 0\}$ is Regular? Justify your answer. **[4]**

b) Construct PDA for following CFG. **[4]**

$S \rightarrow AA$

$A \rightarrow 0A0 / 1A1 / 0 / 1$

c) Define unit Production with example. **[2]**

Q6) Attempt All.

a) Rewrite the following grammar by removing the useless symbols if any. **[4]**

$S \rightarrow aAB / BC / aB$

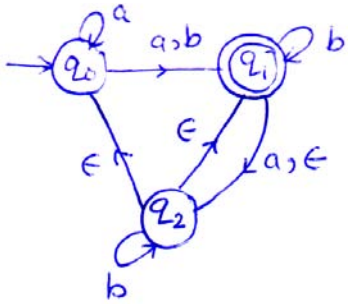
$A \rightarrow bA / aC$

$B \rightarrow bBB / aS / b$

$C \rightarrow CA / BC$

$D \rightarrow dD / d$

b) Construct DFA for the following NFA. **[4]**



c) State Pumping lemma for CFL. **[2]**

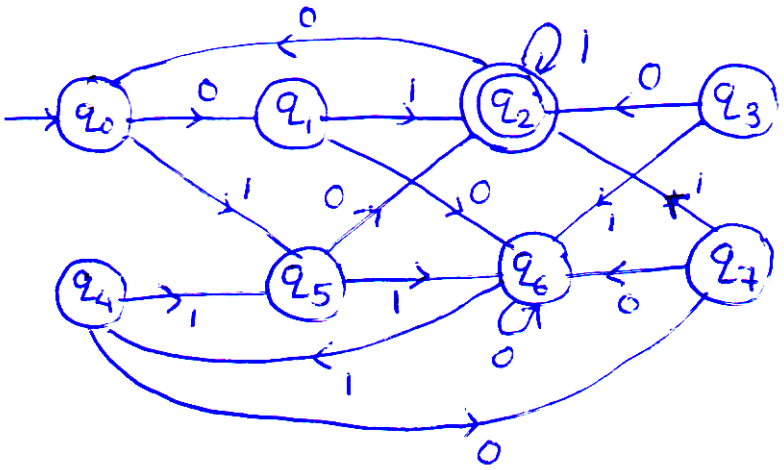
Q7) Attempt All.

a) Construct CFG for $L = L_1 \cup L_2$ where. **[5]**

$L_1 = \{a^n b / n \geq 1\}$

$L_2 = \{ab^n / n \geq 1\}$

b) Minimize the following DFA. **[5]**



Q8) Attempt All.

a) Construct CFG for the following PDA. **[5]**

$$M = (\{q_0, q_1\}, \{a, b\}, \{X, R\}, \delta, q_0, R, \phi)$$

where δ is defined as :

$$\delta(q_0, a, R) = (q_0, XR)$$
$$\delta(q_0, a, X) = (q_0, XX)$$
$$\delta(q_0, b, X) = (q_1, X)$$
$$\delta(q_1, a, X) = (q_1, \in)$$
$$\delta(q_1, \in, R) = (q_1, \in)$$

b) Prove that $\sum_{i=0}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$ is true using mathematical Induction.

[5]

Total No. of Questions : 8] SEAT No. :

P3260 [Total No. of Pages : 3

[4738] - 2003

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

CA - 203 : Object Oriented Programming (C++ Programming)

(2013 Pattern) (Semester - II)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions from the following.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data if necessary.***

Q1) Attempt all of the following : **[4 + 4 + 2 = 10]**

a) What is a constructor? Explain its types with suitabe example.

b) Explain setfill( ) and setro() manipulators with example.

c) Write advantages of object oriented programming.

Q2) Attempt all of the following : **[4 + 4 + 2 = 10]**

a) "A function can return a reference". Justify with example.

b) What are the functions provided by istream class? Explain any two.

c) Explain in short :

i) Data Encapsulation

ii) Compile time polymorphism

Q3) Attempt all of the following : **[4 + 4 + 2 = 10]**

a) What is an inline function? What are its limitations?

b) Write a program in C++ to accept an email address & throw an exception if it does not contain @ a multiple @ symbols.

c) Differentiate between virtual function & pure virtual function.

P.T.O.

Q4) Attempt all of the following : **[4 + 4 + 2 = 10]**

a) How type conversion takes place from class type to basic data type?

b) Write a C++ program to overload function concat() which will concatenate

i) two strings

ii) string and int

c) Write characteristics of static data members.

Q5) Attempt all of the following : **[4 + 4 + 2 = 10]**

a) How operator overloading function is invoked if defined as

i) member function

ii) friend function

b) Explain the concept of constructors in derived classes with example.

c) "A function can be declared as private", state true or false. Justify.

Q6) Attempt all of the following : **[4 + 4 + 2 = 10]**

a) Explain single private inheritance with example.

b) Explain the concept of dynamic constructors with example.

c) What will be the output of following code segment (Assume there are no syntax errors):

```
int top = 3;
class Base
{   protected : int top;
    public     : base (){
                        top = 2;
                        cout<< endl << top;
                        }
};
class derived : public base
{
    private : int top;
    public : derived () : base ()
```

```
    {     top = 1;
          cout << endl << top;
          cout << endl << base :: top;
          cout << endl << :: top;
    }
};
void main ()
{
derived d1;}
```

Q7) Attempt all of the following : **[5 + 5 = 10]**

a) Explain class template with multiple parameters with example.

b) There are 50 records present in a file, each record containing 6-character item-code, 20 characters for item-name and an integer price. Write a program to read these records arrange them in the descending order of price & write them in the same file overwriting the earlier records.

Q8) Attempt all of the following : **[5 + 5 = 10]**

a) Explain error handling functions for files in C++.

b) Create a Base classes patient (pat-name, age, sex), and IPD (wardno, bedno, chargeperday). Derive a class IPD-patient from these two base classes with no-of-days-admitted attribute.

Write necessary member functions to :

i) Input n records

ii) Display all records.

iii) Search a patient by patient name.

Total No. of Questions : 8] SEAT No. :

P3261 [Total No. of Pages : 2

[4738] - 2004

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

COMPUTER SCIENCE

CA - 204 : Computer Networks

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any 5 of the following.***
2) ***Neat diagram must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following: **[4 + 4 + 2 = 10]**

a) Explain the two types of multiplexing.

b) Explain the working of SMTP.

c) Define the following terms.

i) Unicasting.

ii) Multicasting.

Q2) Attempt all of the following: **[4 + 4 + 2 = 10]**

a) A bit stream 1101011011 is transmitted using the standard CRC method. The generator polynomial is $X^4 + X + 1$. Show the actual bit string transmitted.

b) What is congestion? Explain transport layer policies for congestion control.

c) Define the star and bus topologies.

Q3) Attempt all of the following: **[4 + 4 + 2 = 10]**

a) Explain File Transfer Protocol and Hyper Text Transfer Protocol.

b) Explain one-bit sliding window protocol.

c) State any two uses of bridges.

P.T.O.

Q4) Attempt all of the following: **[4 + 4 + 2 = 10]**

a) Explain CSMA/CA in detail.

b) Define computer network. State the goals and need of computer network.

c) Define unipolar encoding.

Q5) Attempt all of the following: **[4 + 4 + 2 = 10]**

a) Explain Synchronous Communication in detail.

b) What is switching? Explain any two types of Switching.

c) What are the advantages of piggybacking technique?

Q6) Attempt all of the following: **[4 + 4 + 2 = 10]**

a) Explain the different features supported by TCP.

b) Write a short note on gateways.

c) Define the term "Noise" and enlist its types.

Q7) Attempt all of the following: **[5 + 5 = 10]**

a) State the difference between Server based and Peer-to-peer LANs.

b) Explain routers and the properties of routing algorithm.

Q8) Attempt all of the following: **[5 + 5 = 10]**

a) Explain factors affecting protocol efficiency.

b) Short note on Pure ALOHA.

Total No. of Questions : 8] SEAT No. :

P3262 [Total No. of Pages : 3

[4738] - 2005

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

CA-205 : ADVANCED DATABASE MANAGEMENT SYSTEM

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions from the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data if necessary.***

Q1) Attempt all of the following :

a) What is mean by Data Replication? Discuss the three ways in which data replication can be performed. **[4]**

b) Discuss characteristics of spatial Database. **[4]**

c) What is mean by complex object? Give any two examples. **[2]**

Q2) Attempt all of the following :

a) Explain Round-Robin partitioning technique. **[4]**

b) What are the implementation challenges of ORDBMs? **[4]**

c) State five wall techniques. **[2]**

Q3) Attempt all of the following :

a) Compare Object Oriented Data Model (OODM) and E-R model. **[4]**

b) Explain shared nothing multiple CPU parallel database architecture. State its advantages. **[4]**

c) State Authentication and Authorization. **[2]**

P.T.O.

Q4) Attempt all of the following :

a) Explain in detail the desired functions of distributed database as compared to centralised DBMs. **[4]**

b) Discuss goals of database security. **[4]**

c) What is mean by object identity? **[2]**

Q5) Attempt all of the following :

a) Consider the following relation.

Company (company-no, company-address, city, company-name, turnover)

Following is the set of simple predicates defined over company.

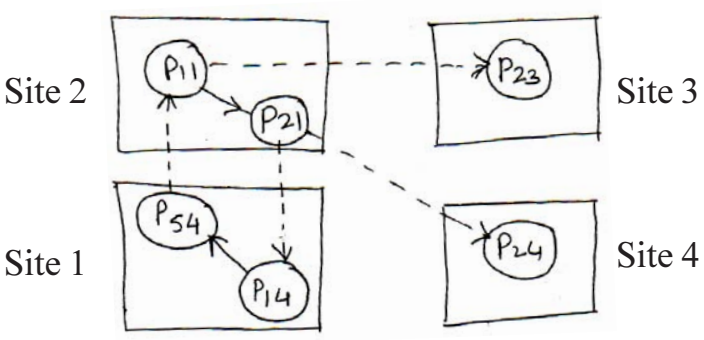
address = 'pune', turnover ≥ 2,00,000? Perform Horizontal fragementation. **[4]**

b) State and explain features of OODBMs. **[4]**

c) State key elements of parallel database processing. **[2]**

Q6) Attempt all of the following :

a) Consider the following DWFG :



Check if deadlock exists in system. If so, find out the sites involved in deadlock. **[4]**

b) What is mean by interoperation and Interoperation parallelism? **[4]**

c) What is ODL? **[2]**

Q7) Attempt all of the following :

a) Write a short note on multimedia database. **[5]**

b) Explain in detail 2-phase commit protocol in distributed database. **[5]**

Q8) Attempt all of the following :

a) Write a note on "Architecture of mobile database" **[5]**

b) What is piplined parallelism? State its advantages and disadvantages. **[5]**

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Total No. of Questions : 5] **SEAT No. :**

P3237 **[Total No. of Pages : 3**

[4738] - 201
M.C.A. - I (Science Faculty) (Semester - II)
COMPUTER SCIENCE
CS - 201 : Data and File Structures Using 'C'
(2008 Pattern)

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

Instructions to the candidates:

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

Q1) Attempt any <u>four</u> of the following: **[4 × 4 = 16]**

a) What is Big oh (O) notation? Arrange following functions by their growth rates.

$N, \sqrt{N}, N^2, N\log_2 N, N\log_2 N^2, N^2, N^3, 2^N$

b) Show all passes to sort the values in descending order using insertion sort for the following data.

20, 10, 8, 6, 15, 7, 1 4

c) Write short note on applications of stack.

d) Linked list in an abstract data type: comment.

e) Write 'C' functions to -

i) insert an element to priority queue

ii) delete an element from priority queue

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

a) Discuss the time complexity of

i) Heap sort

ii) Insertion sort

b) Convert the following infix expression to postfix and prefix form. Show stack contents at each stop

((A + B) ∧ C – (D * E) / F)

c) Write short note on circular linked list.

d) Explain how quene in implemented using linked list?

e) Sort the following data using heap sort. Show all intermediate steps.

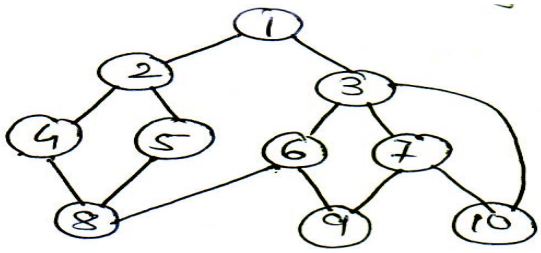
17, 5, 90, 70, 20, 16.

P.T.O.

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

a) Compare and contrast : clustered index and unclustered index.

b) Write DFS algorithm. Show the spanning tree using DFS for the following graph.



c) Write short note on dense indexing.

d) Write 'C' functions to insert node at 1st position and insert node at end of a linked list using dynamic representation.

e) Discuss the applications of linked list.

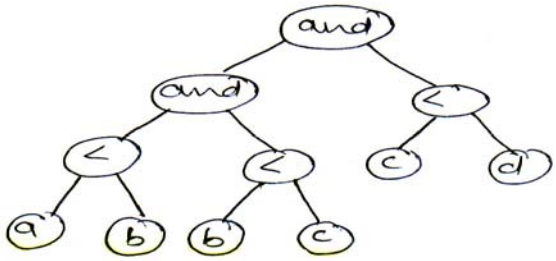
Q4) Attempt any four of the following : **[4 × 4 = 16]**

a) Represent the following polynomial using Generalized linked list. (show diagramatic representation.)

$$x^{10}y^3z^2 + 2x^8y^3z^2 + 3x^8y^2z^2 + x^4y^4z + 6x^3y^4z + 2yz$$

b) Write a 'C' function for non-recursive binary search & show that time complexing of non-recursive binary search = 0 ($n\log_2 n$).

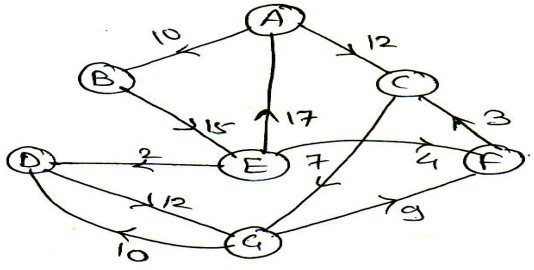
c) Find preorder, postorder and inorder traversal for the following trees.



d) Represent the following graph using

i) Adjacency matrix

ii) Adjacency lists



e) Write 'C' functions to
   i) Compute length of singly linked list.
   ii) Print singly linked list

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

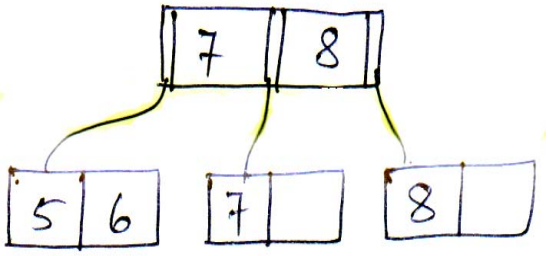
a) Construct BST for the following keys sequence.
   Tushar, Amit, Beena, Pranav, Hemant, Neeta.

b) Define following
   i) AVL tree ii) Balance facter
   iii) Height balance tree iv) Structure of a node in AVL tree

c) Write a short note on deletion of a node in B^+ tree.

d) i) Explain multistack in brief
   ii) Explain the role of hash functions

e) Consider the following B^+ tree. (n = 3)
   i) insert node 4.
   ii) delete node 5 after enserting node 4.



Total No. of Questions : 5] SEAT No. :

P3238 [Total No. of Pages : 3

[4738] - 202
M.C.A. - I (Science Faculty)
CS - 202 : THEORETICAL COMPUTER SCIENCE
(2008 Pattern) (Semester - II)

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

Instructions to the candidates:

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

Q1) Attempt any four of the following : **[4 × 4 = 16]**

a) Construct DFA for all the strings over {p,q,r} that accepts all strings ending with 'qr' and not having substring 'rpq'.

b) i) Define $\in$ - Closure

ii) Write regular expression for language L = Set of all strings of a's & b's that begins & ends with 00 or 11.

c) Construct CFG for following languages.

i) $L = \{a^m b^n c^n d^m | n_1 m \geq 1\}$

ii) $L = L_1 \cup L_2$ where $L_1 = \{a^n b | n \geq 0\}$

$L_2 = \{0^n 1^n / n \geq 0\}$.

d) Construct PDA for the language over {a,b,c} accepting all strings starting with 'b' ending with 'ac' and having substring 'ab' in it.

e) i) Define - Language accepted by Turing Machine.

ii) Explain 3 ways by which Turing machine can be represented.

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

a) Show that relation - aRb if a = b on set S in equivalence relation.

b) Construct Turing machine to replace an occurrence of substring 'bbb' with 'abb' over {a,b}.

c) Convert the following CFG to equivalent GNF.

$S \rightarrow aAS$

$A \rightarrow SbA \mid SS \mid bA$

d) Write construction steps of PDA from final state to empty stack.

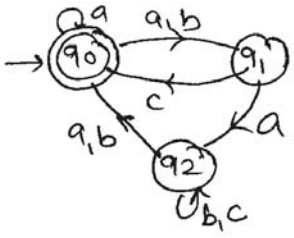
e) Construct finite Automat for following regular expression -

(ab*)* + aab + ab*

P.T.O.

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

a) Convert the following NFA to equivalent DFA.



b) Construct Moore machine over {p,q,r} to give output 'A' if the string ends in 'pqr', give output 'B' if string ends in 'prp' and otherwise gives output 'C'.

c) Convert the following CFG to equivalent PDA.

$S \rightarrow aB \mid bA$

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

$B \rightarrow b \mid bS \mid bBB$

d) i) Type 1,2,3 grammars can be viewed as type 0 grammars with certain restrictions - Justify.

ii) Kind R^+ & R^* where

$R = \{(1,2), (2,2), (2,3)\}$.

e) Differentiate Recursive and Recursively enumerable languages.

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

a) Prove that CFL's are closed under intersection.

b) Convert the following grammar to equivalent CNF.

$S \rightarrow aSa \mid bSb$

$S \rightarrow a \mid b \mid aa \mid bb$

c) Construct Turing machine for the language $L = \{a^n b^n a^n \mid n \geq 1\}$

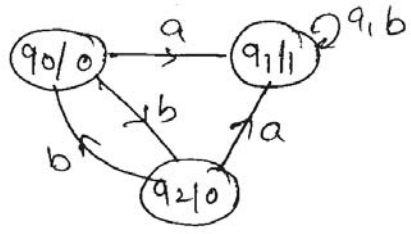
d) Minimize following DFA.

$M = (\{q_0,q_1,q_2,q_3,q_4,q_5\}, \{a,b\}\ \delta,\ q_0,\ \{q_3,q_5\})$

where δ :

	a	b
q_0	q_2	q_4
q_1	q_0	q_5
q_2	q_2	q_4
q_3	q_0	q_4
q_4	q_1	q_3
q_5	q_0	q_5

e) Construct Melay machine from the following Melay machine.



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

a) Check using pumping lemma if the language $L = \{a^{2^n} \mid n \geq 1\}$ is regular.

b) Construct PDA for the following language.

$L = \{a^m b^n c^{n+2} d^m \mid n \geq 1, m \geq 1\}$

c) Rewrite the following grammar by eliminating $\in$ -productions.

$S \rightarrow aS \mid AB$

$A \rightarrow b \mid \in$

$B \rightarrow b \mid \in$

$D \rightarrow b$

d) Construct Turing machine to subtract two unary numbers.

e) Check if the following grammar is ambiguous. Show derivation trees.

$S \rightarrow aB \mid aA$

$A \rightarrow aAB \mid a \mid b$

$B \rightarrow Abb \mid b$

Total No. of Questions : 5] SEAT No. :

P3239 [Total No. of Pages : 3

[4738] - 203

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

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 the right indicate full marks.***
3) ***All questions carry equal marks.***

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

a) Write any four features of object oriented programming.

b) Differentiate between a pointer and a reference variable.

c) Write a C++ statement to allocate memory dynamically for an integer and initialize it to 10 and free that memory.

d) Write any two characteristics of member function.

e) List functions of istream class. Explain any two.

f) Explain seekp ( ) and seekg ( ) functions.

g) Give syntax for overloading << operator.

h) What are characteristics of static number functions?

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

a) Explain multilevel inheritance with example.

b) Write a short note on constructors.

c) How an object can be passed as an argument to a function and a function can return an object? illustrate with suitable C++ Program.

d) How to resolve an ambiguity in multiple inheritance? Explain with example.

e) Give syntax of getline () and write functions. Also explain with example.

P.T.O.

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

a) Write a C++ program to read a file which contains alphabets and digits. create a file "alpha. text" which contains alphabets.

"digit-text" contains digits, from

First file. Display contents of both the files.

b) Write a C++ program to accept records of 'n' employees and store it in an array. class employee contains eno, ename [20], sal attributes. Overload search function as follows:

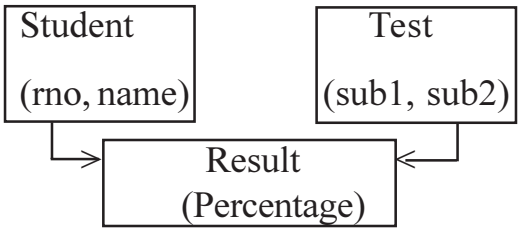
i) int search (employee e [ ], int n , int eno);

ii) int search (employee e [ ], int n, char name [ ]);

iii) int search (employee e [ ], int n, float salary);

Which displays all employees whose sal > salary.

c) Consider following (class) hierarchy :



Implement constructs and display ( ) functions in each classes. Also accept information of 'n' students and sort them in desending order of percentage.

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

a) Write a short note on an iterators.

b) What is dynamic initialization of an objects? Explain with example.

c) What is a friend function? Explain with example

d) Write a C++ program to read information about plant like plant-name, plant-code, plant-type and price. Construct the database with suitable member functions for initialization and destroying the data via constructors, copy constructor and destructor.

e) How to overload binary operator using member function? Explain with example.

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

a) How template function can be overloaded? Explain with example.

b) Write a short note on this pointer.

c) Explain get and put ( ) functions for handling files.

d) What is an abstract class? How to make a class abstract? What is the use of it?

e) What will be the output of the following code segment (Assume there are no syntax errors) :

```
class A
{     public :
      void f1 ( ) {cout <<" Base & 1\n";}
Virtual void f2 ( ) {cout <<" Base f2\n";}
};
Class B : public A
{Public :
      void f1 ( ) { cout <<" Derived f1\n";}
      void f2 ( ) { cout <<" Derived f2\n";}
};
Main ( )
{A aobject bptr;
 B boject;
bptr = & aobject ;
bptr → f1 ( );
bptr → f2 ( );
bptr = & bobject;
bptr → f1 ( );
bptr → f2 ( );
```

Total No. of Questions : 5] SEAT No. :

P3240 [Total No. of Pages : 3

[4738] - 204

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

COMPUTER SCIENCE

CS-205 : Database Management System

(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) ***Assume appropriate data, if necessary.***

Q1) Attempt any four of the following: **[4 × 4 = 16]**

a) State the responsibilities of DBA.

b) Define trivial dependencies.

c) State different types of database users.

d) State wait-die scheme for deadlock prevention.

e) Define:

i) INF

ii) 2NF

f) What is data abstraction?

g) What is a lock?

h) List different data types available in SQL.

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

a) Write any four functions of DBA.

b) What are the disadvantages of life processing?

c) Explain in detail lossless join decomposition.

d) Compute $(AG)^+$ With the following FD's

$$F = \{A \rightarrow B, A \rightarrow C, CG \rightarrow H, CG \rightarrow IB \rightarrow H\}$$

e) What are different types of integrity constraints that can be specified on database?

P.T.O.

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

a) Explain two-phase locking protocol.

b) Consider the following relations:

Wholesaler (wno, wname, addr, city)

Product (p-no,p-name)

Wholesaler and product are related with many to many relationships. Create a relational data base and convert in 3 NF and solve the following queries in sq1

i) List all the wholesaler of the product "book".

ii) Count the number of wholesaler in the city "Pune".

c) Explain Aggregation with an example.

d) Explain Database System Architecture with diagram.

e) What are the different properties of transaction maintained by DBMS?

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

a) Explain encryption. What is public-key encryption?

b) What is a transaction? In what ways is it different from an ordinary program?

c) What are different set operations available in SQL? Explain with the help of examples.

d) Following is the list of the events in an interleaved execution of set of transaction T_1, T_2 T_3, T_4, with 2PL

Is there deadlock in the system? If yes which transaction are involved in deadlock.

Time	Transaction	Code
t_1	T_1	Lock (A,X)
t_2	T_2	Lock (B,S)
t_3	T_3	Lock (A,S)
t_4	T_4	Lock (B,S)
t_5	T_1	Lock (B,X)
t_6	T_2	Lock (C,X)
t_7	T_3	Lock (D,S)
t_8	T_4	Lock (D,S)

e) Explain Strong entity set and weak entity set in detail.

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

a) A banking enterprise which records information about customers, employees of bank. A customer can be depositor or borrower. An employee of a bank can be customer of bank.

There are two types of accounts, saving account or current account.

i) Identify all entities with their attributes and primary keys.

ii) Draw an E-R diagram.

iii) Slove the following queries:

1) Add a new column access-date in the account table.

2) List the names of customers having more than one account.

b) Explain Thomas write rule in detail.

c) Define a view. State its purpose. Discuss with syntax how to create and delete a view.

d) What is data independence? Explain it.

e) Consider the following transaction. Fine out any two non-serial schedules which are serializable to serial schedule<T1, T2, T3>

T1	T2	T3
Read(a)	read(c)	Read(a)
a:=a- 100	c:=c*10	a:=a+a*12
write(a)	write(c)	write(a)
read(b)	read(d)	read(c)
b:=b+100	d:=d–100	c:=c+1000
write(b)	write(d)	write(c)

Total No. of Questions : 8] **SEAT No. :**

P3263 **[Total No. of Pages : 4**

[4738] - 3001
M.C.A. (Science Faculty) (Semester - III)
CA - 301 Design and Analysis of Algorithms
(2013 Pattern)

Time : 3 Hours] ***[Maximum Marks : 50***

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Solve any five [5] from the following.***

Q1) Attempt all of the following :

a) Explain fast fourier transform and its properties. **[4]**

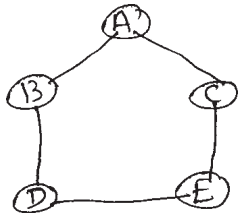
b) Solve the given instance of TSP by using Branch and Bound reduced cost matrix method. **[4]**

$$\begin{bmatrix} \infty & 4 & 9 & 5 \\ 6 & \infty & 4 & 8 \\ 9 & 4 & \infty & 9 \\ 5 & 8 & 9 & \infty \end{bmatrix}$$

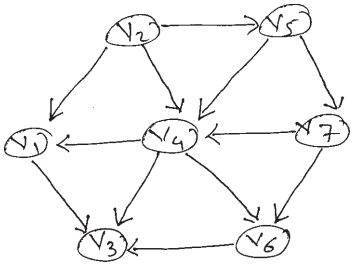
c) Construct the heap tree for following data {10, 5, 3, 9, 7, 6}. **[2]**

Q2) Attempt all of the following :

a) For the following graph find out the all possible solutions with m = 3. **[4]**



b) Find the topological order for the following graph G. **[4]**



P.T.O.

c) Write a recursive algorithm for calculating factorial. **[2]**

Q3) Attempt all of the following :

a) Write a note on FFT (fast fourier transform) Interpolation. **[4]**

b) Solve the following O/I knapsack instance by

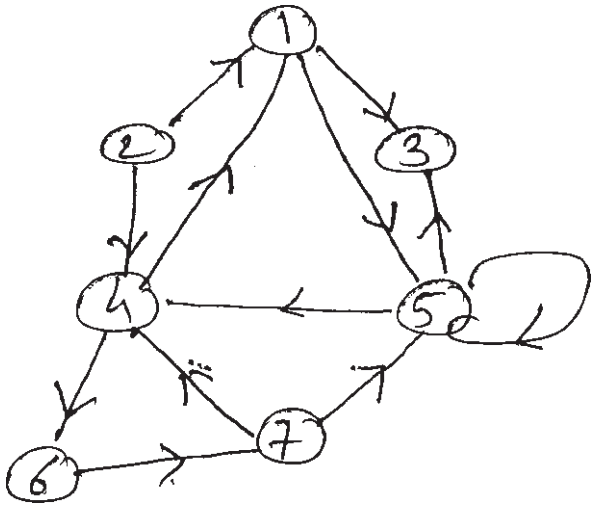
LCBB n = 4$\{p_1, p_2, p_3, p_4\} = \{10, 10, 12, 18\}$ **[4]**

$\{w_1, w_2, w_3, w_4\} = \{2, 4, 6, 9\}$ and m= 15.

c) Show that $n^2 \neq O(\text{lon})$. **[2]**

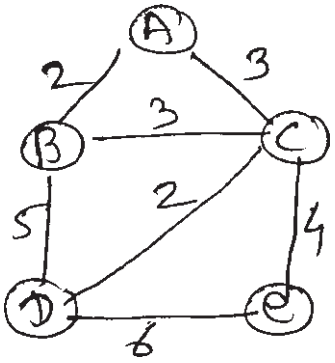
Q4) Attempt all of following :

a) Find strongly connected components of given graph. **[4]**



b) Explain the 8 queens problem with its explict and implicit constraints. **[4]**

c) Using kruskal's algorithm find spanning tree of given graph. **[2]**



Q5) Attempt all of the following :

a) Write a merge sort algorithm with it time complexity. **[4]**

b) Bellman ford algorithm find lengths of shortest paths from source a to all other vertices. **[4]**

	a	b	c	d	e
a	0	1	–3	2	–4
b	3	0	–4	1	–1
c	7	4	0	5	3
d	0	–1	–5	0	–2
e	8	5	1	6	0

c) Explain control of Abstraction for greedy method. **[2]**

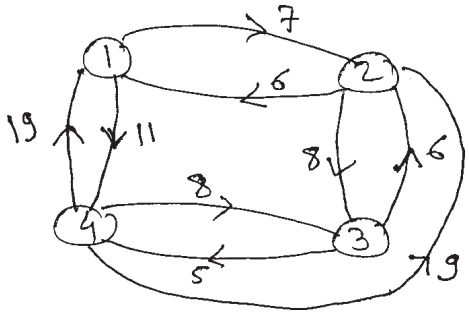
Q6) Attempt all of the following :

a) Obtain sequence of jobs such that profit is maximized and many jobs can be finished **[4]**

n = 5 p = {20, 15, 10, 5, 1}

d = {2, 2, 1, 3, 3}

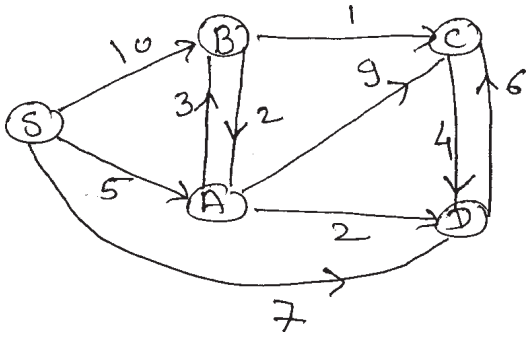
b) Solve travelling sales person problem (TSP) using dynamic programming for graph G. **[4]**



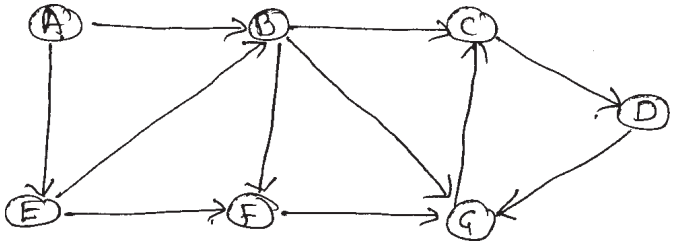
c) What is satisfiabillity problem? State cook's theorem. **[2]**

Q7) Attempt all of the following :

a) Apply the dijkstra's algorithm on the directed graph given below where S is the source. **[5]**



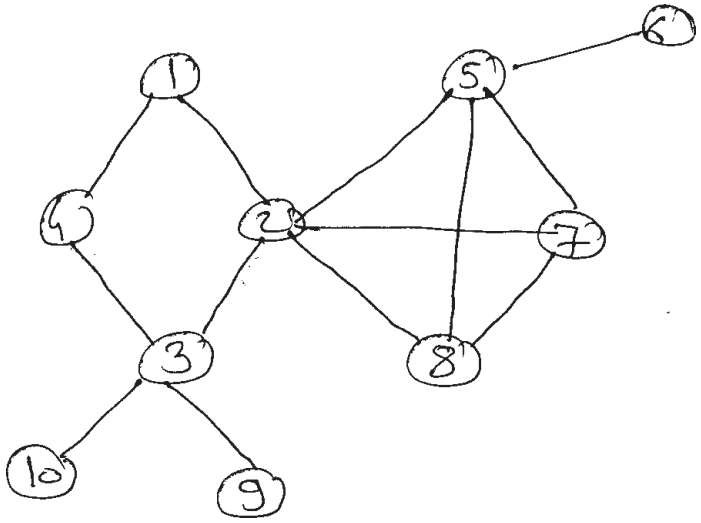
b) Find the DFS and BFS for the given graph. **[5]**



Q8) Attempt all of the following :

a) Find an optimal paranthesization of a matrix - chain product whose sequence of dimensions (20, 5, 10, 10 5). n = 5. **[5]**

b) Find articulation point and Bi - connected component of given graph 'G'. **[5]**



♦♦♦♦

Total No. of Questions : 8] SEAT No. :

P3264 [Total No. of Pages : 3

[4738] - 3002

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

CA - 302 : Operating Systems

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any 5 questions.***
2) ***Figures to the right indicate full marks.***

Q1) Answer the following :

a) List the system calls related with system accounting/information and explain any two **[4]**

b) Explain what is process scheduling? Discuss different types of schedulers. **[4]**

c) What is semaphore? **[2]**

Q2) Answer the following :

a) What is deadlock? Give various ways by which one can recover from deadlock. **[4]**

b) Explain contiguous memory allocation method. **[4]**

c) What is TLB miss? **[2]**

Q3) Answer the following :

a) Explain linked allocation method in file system **[4]**

b) Explain readers-writers problem. **[4]**

c) What is P thread? **[2]**

Q4) Answer the following :

a) What is critical section problem? What are the conditions that must be satisfied while designing solution to critical section problem? List various ways to handle it. **[4]**

b) What are the guidelines for selecting a disk scheduling algorithm? **[4]**

c) Which scheduler centrals the degree of multiprogramming? How? **[2]**

P.T.O.

Q5) Answer the following :

a) Explain PCB with suitable diagram. **[4]**

b) Write a note on file operations. **[4]**

c) What is multithreading? **[2]**

Q6) Answer the following :

a) What are the necessary conditions for a deadlock to occur? **[4]**

b) Explain the scheduling criteria followed for different CPU scheduling algorithms. **[4]**

c) Define term Kernel-thread and user thread **[2]**

Q7) Answer the following :

a) Consider the following snapshot of a system **[5]**

Process	Allocation				Max			
	A	B	C	D	A	B	C	D
P0	0	3	2	4	6	5	4	4
P1	1	2	0	1	4	4	4	4
P2	0	0	0	0	0	0	1	2
P3	3	3	2	2	3	9	3	4
P4	1	4	3	2	2	5	3	3
P5	2	4	1	4	4	6	3	5

Available	A	B	C	D
	1	2	4	5

Answer the following questions using Balancers algorithm

- What is the centcnt of need matrix?
- Is the system in Jafe state?

b) Consider the following snapshot of a system. **[5]**

Process	CPU Burst Tirm	Irrival time
P1	10	0
P2	5	4
P3	2	3
P4	16	5
P5	8	2

Draw proper Gantt chart and find avg turn around time &waiting time using.

- FCFS - SJF (non-preemptire)

Q8) Answer the following :

a) Consider paye reference string **[5]**

7, 5, 6, 2, 9, 5, 7, 6, 2, 7, 6, 5, 2, 7, 2, 7, 8.

Answer 3 frames. Find the number of page faults according to.

- CRU - Optional

b) Let head of a moving dists with 200 trachts numbered 0 to 193 is cutrentey at 53. Consider the following request. **[5]**

100, 98, 183, 37, 122, 14, 124, 65, find the total head movement using

- SCAN - C-SCAN

Total No. of Questions : 8]

SEAT No. :

P3265

[Total No. of Pages : 3

[4738] - 3003

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

CA - 303 : Software Engineering

(2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt any five of the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt the following :

a) Explain waterfall model with diagram. **[4]**

b) Explain any four Mc. call's quality factor. **[4]**

c) Define stress testing. **[2]**

Q2) Attempt the following :

a) What is coupling? Explain types of coupling. **[4]**

b) Explain project life cycle with different phases. **[4]**

c) Give the steps for prototyping model. **[2]**

Q3) Attempt the following :

a) Explain Reverse Engineering with diagram. **[4]**

b) Explain the concept configuration management. **[4]**

c) Define system Analysis. **[2]**

P.T.O.

Q4) Attempt the following :

a) Describe software crisis in brief. **[4]**

b) Describe feasibility study in brief. **[4]**

c) Define software Engineering. **[2]**

Q5) Attempt the following :

a) Explain the Role of system Analyst in brief. **[4]**

b) Describe the steps for building a decision table. **[4]**

c) Define ripple effects. **[2]**

Q6) Attempt the following :

a) Differentiate between programming in small and programming in large. **[4]**

b) Explain in brief Quality model. **[4]**

c) Define software maintenance. **[2]**

Q7) Attempt the following :

a) Differentiate between verification and validation. **[5]**

b) Design a prototype of input screen for entering patient's information in Hospital Management System. **[5]**

Q8) Attempt the following :

a) Explain testing principles and objectives. **[5]**

b) Bank provide schemes through which people can deposit the money with a bank as a fixed deposit for a certain period of time the banks pay interest for this period and return the money when the fixed deposit period is overs. Interest rate depends upon the period as follows. **[5]**

Fixed deposit period	Interest rates
30 to 180 days	10%
181 to 364 days	11%
1 to 2 years	12.5%
2 to 3 years	14%
more than 3 years	15.5%

The depositor may choose to renew the FD for another time period.

Find out the entities, Draw Context level, first level DFD.

Total No. of Questions : 8]

SEAT No. : ____

P3266

[Total No. of Pages :3

[4738] - 3004

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

CS : 304 : JAVA

(2013 Pattern)

Time :3 Hours] ***[Max. Marks :50***

Instructions to the candidates:

1) ***Attempt any five of the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt all of the following.

a) Explain the concept of wrapper classes in brief. **[4]**

b) Write a note on anonymous Inner classes. **[4]**

c) "Java is pure object - oriented language.Comment. **[2]**

Q2) Attempt all of the following:

a) Write a java program to display the following pattern. **[4]**

```
1
3  3
5  5  5
7  7  7  7
```

b) Write a program to copy the content of source file to target file using command line arguments. **[4]**

c) How can we pass parameters to an applet. **[2]**

P.T.O.

Q3) Attempt all of the following.

a) Explain all the methods of mouse listner interface with syntax. **[4]**

b) Write a program to accept two strings as command line arguments & perform the following operations.

i) Check if the first string begins with the second string.

ii) Compare two strings.

iii) Display no. of occurrances of second string present in the first string. **[4]**

c) Explain printwriter class. **[2]**

Q4) Attempt all of the following.

a) Explain any four methods of date class. **[4]**

b) Explain method overloading & method overriding with example. **[4]**

c) Explain update ( ) and repaint ( ) method. **[2]**

Q5) Attempt all of the following .

a) Explain Event handling mechanism in brief. **[4]**

b) Write a program for inter communication of multiple threads. **[4]**

c) Differentiate between streamreader and streamwriter. **[2]**

Q6) Attempt all of the following .

a) Write a program to accept a number from text field.Using two radio buttons it will display binary equivalent or octal equivalent of given number.(USE AWT). **[4]**

b) Explain Java thread model with its life cycle. **[4]**

c) What is final & blank final variable. **[2]**

Q7) Attempt all of the following .

a) What is a package ? How to create & access packages in Java? Explain with example. **[5]**

b) Write a program to select color using colorchooser & change the background color of the frame using swing. **[5]**

Q8) Attempt all of the following .

a) Write a note on model view controller Architecture for swing. **[5]**

b) Write a class student with name & marks. if name contains digits raise user - defined exception "Name not valid" and throw it. **[5]**

Total No. of Questions : 8] **SEAT No. :**

P3267 **[Total No. of Pages : 3**

[4738]-3005

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

CA - 307 : Numerical Methods

(2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***All questions carry equal marks.***
3) ***Use of scientific, Non programmable calculator is allowed.***
4) ***Figures to the right indicate full marks.***

Q1) All questions are compulsory

a) Using Gauss forward formula, find the value of f(x) when x = 0.5 From the data given. **[4]**

x	2	1	0	-1
f(x)	100	108	105	110

b) Use Eulers method to find y(0.2), given $\frac{dy}{dx} = 3x^2 + y$ with y(0) = 4 take h = 0.2 **[4]**

c) Find relative error of the number 1.53364 **[2]**

Q2) All questions are compulsory.

a) From the following data estimate y at x = 8 **[4]**

x	3	7	9	10
y	168	120	72	63

P.T.O.

b) Calculate approximate value of $\int_1^3 \frac{dx}{x}$ with 6 strips and compare it with actual integration. **[4]**

c) Locate the error and correct it of the data. **[2]**

-1, 0, 7, 26, 65, 124, 215, 342, 511

Q3) All questions are compulsory.

a) If f(0) = 1, f(1) = 2.72, f(2) = 7.39, f(3) = 20.09 and f(4) = 54.60 find $\int_0^4 f(x)\, dx$ **[4]**

b) Use Runge Kutta method of fourth order to solve $\frac{dy}{dx} = 3x + \frac{y}{2}$ with y(0) = 1, find y(0.1), take h = 0.1 **[4]**

c) Differentiate between Lagranges Interpolation and newton's forward interpolation **[2]**

Q4) All questions are compulsory.

a) Evaluate $\Delta\left[\frac{2^x}{x+h}\right]$ take h = 1 **[4]**

b) Given $\frac{dy}{dx} = 1 - y$ with y (0) = 0, find y (0.1) using Euler's Modified method take h = 0.1 **[4]**

c) Differentiate between trapezoidal rule and simpsons $\frac{1}{3}$ rule of integration **[2]**

Q5) All questions are compulsory.

a) Find square root of 10 corrected up to 3 decimal places by Regula falsi method. **[4]**

b) Prove by prope notation's that $\Delta^3 y_0 = y_3 - 3y_2 + 3y_1 - y_0$ **[4]**

c) Define absolute error of a number **[2]**

Q6) All questions are compulsory.

a) Find a real root of the equation x sin x + cos x = 0 corrected to three decimal places using Newton Raphson method take $X_0 = 2.5$ **[4]**

b) Estimate the missing term of following data. **[4]**

x	10	20	30	40	50
y	990	7980		63960	124950

c) List Two advantages of Lagranges interpolation **[2]**

Q7) All questions are compulsory.

a) Using the method of separation of symbols show

that $u_x = u_{x-1} + \Delta u_{x-2} + ... + \Delta^{n-1} u_{x-n} + \Delta^n u_{x-n}$ **[5]**

b) Find polynomial from the table and hence find y when x = 0.5 **[5]**

x	0	1	2	3	4
y	3	6	11	18	27

Q8) All questions are compulsory.

a) Derive Newtons forward interpolation formula. **[5]**

b) The population of a town in decennial census were as under **[5]**

Year	1921	1931	1941	1951	1961
Population in thousands	46	66	81	93	101

Estimate the population for the year 1955.

ⓘⓘⓘⓘ

Total No. of Questions : 8] **SEAT No. :**

P3268 **[Total No. of Pages : 2**

[4738] - 3006
M.C.A. (Under Science) (Semester - III)
CA-308 : Multimedia Systems
(2013 Pattern)

Time : 3 Hours] ***[Max. Marks : 50***

Instructions to the candidates:

1) ***Figures to the right indicate full marks.***
2) ***Solve any five.***

Q1) Answer the following.

a) Explain Color Management System. **[4]**

b) Explain Digital Audio Signal Processing. **[4]**

c) Define Multimedia Document. **[2]**

Q2) Answer the following :

a) Explain SGML. **[4]**

b) Explain basic steps of image processing. **[4]**

c) What is Source Encoder and Destination Decoder. **[2]**

Q3) Answer the following :

a) Explain Digital Representation of sound. **[4]**

b) Explain MPEG file format. **[4]**

c) Explain OMF file format. **[2]**

Q4) Answer the following :

a) Explain Hytime format. **[4]**

b) Explain DPCM. **[4]**

c) What is Entropy coding. **[2]**

Q5) Answer the following :

a) Explain principles of video compression. **[4]**

b) Explain transmission process of digital sound. **[4]**

c) Explain source encoding. **[2]**

P.T.O.

Q6) Answer the following :

a) Explain JPEG file format. **[4]**

b) Explain multimedia system service architecture. **[4]**

c) List models of time. **[2]**

Q7) Answer the following :

a) Explain spectrum partition in detailed. **[5]**

b) What is interactive application? How it works over the internet. **[5]**

Q8) Answer the following :

a) Explain Intra and Inter object synchronization. **[5]**

b) Explain static and dynamic Haffman coding. **[5]**

♦♦♦♦

Total No. of Questions : 8] SEAT No. :

P3269 [Total No. of Pages : 2

[4738] - 3007

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

COMPUTER SCIENCE

CA - 309 : Dot Net

(2013 Pattern)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Answer any five questions.***
2) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right side indicates full marks.***
4) ***Assume suitable data if necessary.***

Q1) a) Explain compilation process of .Net. **[4]**

b) List and explain phases of garbage collection. **[4]**

c) Explain property and indexer with example. **[2]**

Q2) a) What is assembly? What are types of assembly? **[4]**

b) Write a C# program to create object of a class Employee(Name, age, mobileno). Throw an exception 'NegativeAgeException' if age is negative. (Accept data members from user) **[4]**

c) List any four methods of Graphics class. **[2]**

Q3) a) What is Reflection? What is late binding in Reflection? **[4]**

b) What is synchronization? Explain thread synchronization using Monitor with example. **[4]**

c) Explain any two methods of System. GC class with example. **[2]**

Q4) a) Create an abstract class Shape with methods calc_area and calc_volume. Derive two classes Sphere(radius) and Cylinder(radius, height) from it. Calculate area and volume of all. **[4]**

b) Explain ADO.NET components. **[4]**

c) How exceptions are handled? **[2]**

P.T.O.

Q5) a) Explain any four methods and four events of Form class. **[4]**

b) Write a C# program to read 10 numbers in an ArrayList. Find maximum of these 10 numbers. **[4]**

c) Differentiate between reference type and value type. **[2]**

Q6) a) Explain how HTML controls are used in ASP.NET. **[4]**

b) What are delegates? Explain multicast delegates in detail. **[4]**

c) State the purpose of ExecuteReader and ExecuteScalar methods. **[2]**

Q7) a) How to send argument from command line? Write a program to accept a number from command line and check if it is a perfect number. **[5]**

b) Explain ASP.NET page lifecycle. **[5]**

Q8) a) What is a stream? Write a C# program to read two file names from user and append the contents of first file to second file and display its contents. **[5]**

b) Define Cookie and QueryString. Explain session state management using SQL server. **[5]**

Total No. of Questions : 4]

SEAT No. :

P3241

[Total No. of Pages : 4

[4738] - 301

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

COMPUTER SCIENCE

CS - 301 : Design and Analysis of Algorithm

(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 **[8 x 2 = 16]**

a) Explain Big-oh (O) and Omega (Ω) notation to denote complexities.

b) Discuss the time complexity of Insertion sort in Best case and Worst case running time.

c) What is satisfiability problem? State Cook's theorem.

d) Define Explicit and Implicit constraints of 8 Queen problem.

e) Define articulation point and Bridge Edge.

f) Define principle of optimality. State one essential difference between greedy method and dynamic programming.

g) What do you mean by stable sorting algorithm? Is quick sort a stable sorting algorithm.

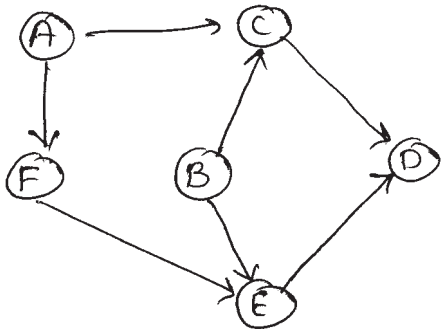
h) Why bounding function are useful in the context of branch and bound?

P.T.O.

Q2) Attempt ANY FOUR: **[4 x 5 = 20]**

a) Explain Strassen's matrix multiplication algorithm. Is it an improvement over usual matrix multiplication? Why?

b) Explain topological sort algorithm for a directed graph. Illustrate it on the following graph.



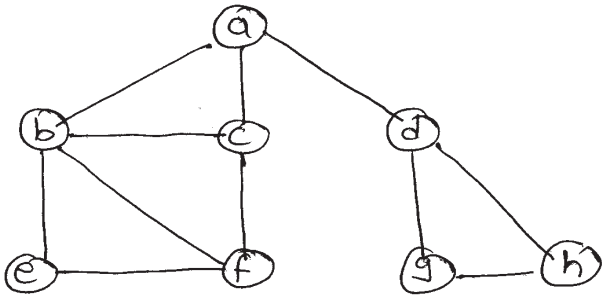
c) Explain sum of subsets problem with an example. Give the explicit and implicit constraints in case of fixed tuple size solution problem. Give the bounding function for the same.

d) Explain the travelling salesperson problem and develop the recurrence relation using dynamic programming and show that the time complexity is $\theta(n^2 2^n)$.

e) Consider 0 | 1 Knapseack problem with
n = 4 m = 21 p = (13, 11, 12, 15)
w = (6, 5, 7, 8)
using dynamic programming.

Q3) Attempt ANY FOUR: **[4 x 8 = 32]**

a) Illustrate the progress of DFS and BFS on the graph.

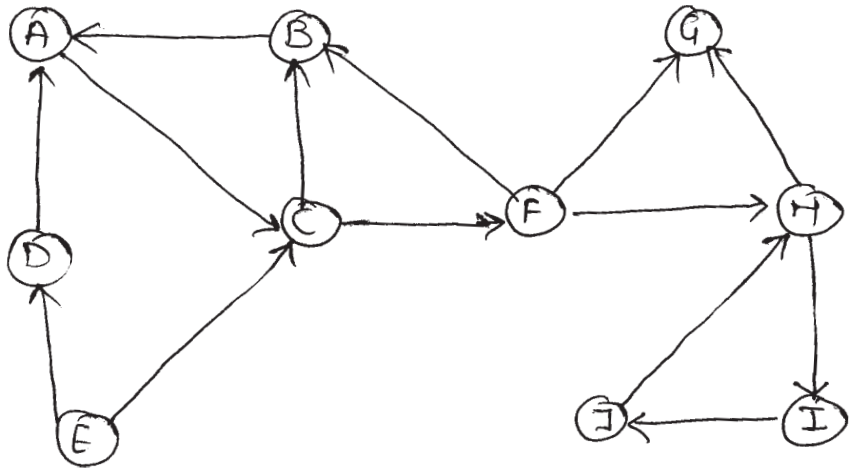


starting at node 'a'.

b) A string X can be transformed into a string Y by applying a sequence of edit operations such as insert, delete and inter change with associated costs of 1, 1 and 2 respectively. Give the recurrence relation for the value of the optimal solution when the problem is to be solved using dynamic programming for X = a, a, b, a, a, b, a, b and
Y = b, a, b, a, a, b, a give the matrix of the values computed in bottom up manner.

c) Explain divide and conquer strategy. Devise binary search algorithm using above strategy. State its time complexity.

d) What are strongly connected component? Give the algorithm to compute strongly connected components using DFS. Find the strongly connected components of the following graph using the above algorithm.



e) What is 0 | 1 Knapsack problem? Give the LCBB formulation of 0 | 1 Knapsack problem. Draw the state space tree generated by LCBB for the following Knapsack instance n = 5

p = (10, 6, 15, 4, 8)

w = (4, 3, 6, 4, 2)

Q4) Attempt ANY THREE: **[3 x 4 = 12]**

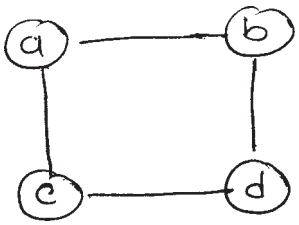
a) Find an optimal solution for Knapsack

n = 7 p = (10, 5, 15, 7, 6, 18, 3)

m = 15 w = (2, 3, 5, 7, 1, 4, 1)

using greedy method.

b) For the following graph. Find out all possible solutions with M = 3. Also show that solution with exactly 3 colors.



c) What is a minimum Cost Spanning tree? Explain Prim's algorithm to obtain minimum spanning tree.

d) Explain Dijkstra's algorithm. What is it's time complexity?

e) Explain optimal binary merge pattern and find one for eight files whose lengths are

28, 32, 12, 5, 48, 13, 35, 11.

Total No. of Questions : 5] SEAT No. :

P3242 [Total No. of Pages : 2

[4738] - 302
M.C.A. - II (Semester - III) (Under Science Faculty)
COMPUTER SCIENCE
CS - 302 : Computer Networks
(2008 Pattern)

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

Instructions to the candidates:

1) ***All Questions are compulsory***
2) ***Neat Diagrams must be drawn whenever necessary.***
3) ***Figures to the rights indicate full marks.***

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

a) Define Protocol Stack.

b) Define Port Address and Socket Address.

c) Define Signal element and Data element.

d) Define Hamming Distance with example.

e) What is Polling?

f) What is the minimum and maximum payload length of IEEE 802.3 MAC Frame?

g) Find the Class, Netid, Hostid and Subnetid for the IP address 207.3.54.12/16.

h) What is Supernetting?

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

a) How network layer implements connection less and connection oriented services?

b) What is Line Coding? Explain any two schemes with example.

c) Explain 1-bit Sliding window protocol.

d) What is full-duplex Ethernet? Why there is no need for CSMA/CD in a full-duplex Ethernet LAN?

e) Explain CSMA/CA.

P.T.O.

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

a) Explain Service Primitives.

b) Explain CDMA.

c) Construct a CRC message for the given polynomial $x^{10}+x^7+x^3+1$ and the generator polynomial is x^5+x^3+1.

d) What are different causes of Transmission Impairments? Explain.

e) What is the difference between a unicast, multicast and broadcast address in IEEE 802.3 MAC Frame?

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

a) Gives the names of the layers of OSI model which perform the following tasks:

i) Communicate directly with user's application program.

ii) Error correction and retransmission.

iii) Mechanical, electrical and functional interface.

iv) Responsibility for carrying frames between adjacent nodes.

b) Explain Shannon's Capacity formula. We have a channel with 4KHs bandwidth. The SNR for this channel is 64. What is the bit rate?

c) Explain ALOHA - pure, slotted.

d) Explain VLAN.

e) Change the IP address into Binary Notation and find its class.

i) 114.34.12.8

ii) 127.24.6.8

iii) 192.168.0.52

iv) 232.34.2.1

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

a) What is Topology? Compare advantages and disadvantages of Mesh vs Star Topology.

b) Explain TCP/IP and compare it with OSI model.

c) Explain the advantages and disadvantages of Optical Fiber.

d) What is Sliding Window? How it is used in Go back n and Selective Repeat.

e) Explain NAT.

Total No. of Questions : 5] **SEAT No. :**

P3243 **[Total No. of Pages : 3**

[4738] - 303

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

CS - 303 : System Programming and Operating System

(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 all of the following : **[8 × 2 = 16]**

a) List any four operations of a file.

b) What is a semaphore?

c) Define the difference between preemptive and non-preemptive scheduling.

d) What is spooling process?

e) What is starvation?

f) What is compiler?

g) Explain linked allocation method in file system.

h) Is it possible to have deadlock involving only one process? State your answer.

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

a) Explain different types of schedulers in brief.

b) Explain LRU and MRU.

c) Write a short note on DMA.

d) What are the necessary conditions for a deadlock to occur?

e) Explain acyclic-graph directory structure.

P.T.O.

Q3) Attempt any <u>four</u> : **[4 × 4 = 16]**

a) Consider a system with 5 processes. P0 through P4 & 3 resources types A, B, C. Resource type 'A' has 10 instances, 'B' has 5 and 'C' has 7 instances. Suppose at time To, system status is as follows-

	Allocation			Max			Available		
	A	B	C	A	B	C	A	B	C
P0	0	1	0	7	5	3	3	3	2
P1	2	0	0	3	2	2			
P2	3	0	2	9	0	2			
P3	2	1	1	2	2	2			
P4	0	0	2	4	3	3			

Answer the following questions using Banker's algorithm.

i) What is the content of Matrix Need?

ii) Is the system in a safe state?

b) Consider the reference string :

1, 2, 3, 4, 1, 2, 5, 1, 2, 3, 4, 5

How many page faculties occur for algorithms :

i) FCFS ii) MRU No. of frames = 3.

c) Consider the following set of processes -

Process	Arrival Time	Burst Time
P1	0	8
P2	1	4
P3	2	9
P4	3	5

Illustrate the execution of these & Processes using Non-preemptive SJF CPU Scheduling algorithm. Calculate average waiting time and average turn around time. Draw Grantt Chart.

d) Let head of moving disk with 200 tracks numbered from 0 to 199 is currently at 80. It has served the request (previous) at 70. Consider the queue of requests as follows : 100, 40, 25, 60, 120, 90, 110. Compute the total head movements using SSTF and look algorithm.

e) Compare optimal and LRU page replacement algorithms with example.

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

a) What resources are used when a thread is created? How do they differ from those used when a process is created?

b) Explain first - fit, Best - fit, & worst - fit memory allocation technique.

c) Explain deadlock recovery techniques.

d) Explain the concept of virtual file system.

e) Explain Dining philosopher problem.

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

a) Explain the file - system structure.

b) Explain Process Control Block.

c) Explain the deadlock Detection algorithm.

d) What is safe state, unsafe state and deadlocked state space?

e) Write a short note on Pthreads.

Total No. of Questions : 5]

SEAT No. :

P3244

[Total No. of Pages :3

[4738] - 304

M.C.A. (Under Science Faculty)

COMPUTER SCIENCE

CS - 305 : Event Driven Programming (Win 32 SDK)

(2008 Pattern) (Semester - III)

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

Instructions to the candidates:

1) ***All questions are compulsory.***
2) ***Assume suitable data, if necessary.***
3) ***WinMain not needed.***
4) ***Figure to the right indicate full marks.***

Q1) Design the database table for Mall Information about customer and Items in a data source named "Malldata" Write a SDK menu driven program. **[12]**

i) Display the information about Items, whose price > 10000.

ii) Display the customer details whose purchase is maximum.

iii) Delete the customer whose location is "Mumbai".

Q2) Write program statements using Win 32 APIs for any four of the following. **[4 × 5 = 20]**

a) Display the caret at the top left corner of client area and handle left and right arrow keys appropriately. Show the caret position at the center of the client area.

b) Create a PushButton of the size of the screen.

c) To divide the client area into 8 x 8 chess board,where all cells are of equal size.

d) Create Two threads, one displays "Welcome" at center position on the screen and second displays "Bye" at random position on the screen.

e) To change the color of the client area whenever Right button is clicked.

P.T.O.

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

a) What are the advantages of DLL?

b) What all methods will return a Device context (DC)?

c) Why queues are used in keyboard messages?

d) Write a Syntax of Polyline () function.

e) Write a case section where you will get a confirmation from the user before terminating the program?

f) Which are the different window resources?

g) How does WinProc known whether character data is 8 bit ANSI or 16 bit Unicode?

h) How to associate a DlgProc to a Dialog box?

i) What is the sequence of the message generated when the user presses shift 'A'?

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

a) Function that will be statically linked are usually stored in either .obj or .lib files.

b) WM_TIMER is a queued message.

c) Time message are not asynchronous.

d) After calling create caret, there is no need to call show caret.

e) The code for dynamically linked function does not appear in your program's .EXE file.

f) GetDlgItem function is used to check the validity of WM_CHAR message.

g) Any menu that is attached to a window is automatically destroyed when the window is destroyed.

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

a) Write a Note on Device Context.

b) What is MDI? Explain elements of MDI.

c) Explain the syntax of any five GDI drawing function.

d) Explain Send and Post message.

e) Write a difference between Win 32 and Dos.

Total No. of Questions : 8]

SEAT No. :

P3389

[Total No. of Pages : 2

[4738] - 4001

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

CA - 401 : Computer Graphics

(2013 Pattern) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any Five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Attempt the following:

a) Explain the architecture of Raster Scan Display. **[4]**

b) Obtain 3D transformation for following: **[4]**

i) Rotation.

ii) Translation.

iii) Scaling.

c) Explain HLS color model. **[2]**

Q2) Attempt the following:

a) Explain midpoint subdivision algorithm. **[4]**

b) Explain 2D viewing pipeline with suitable diagram. **[4]**

c) Distinguish between convex and concave polygons. **[2]**

Q3) Attempt the following:

a) Obtain 2D transformation matrices for the following: **[4]**

i) Shear (X & Y shear).

ii) Rotation.

iii) Scaling.

b) Write a short note on: **[4]**

i) Touch Panel.

ii) Light Pen.

c) Define bitmap and pixmap. **[2]**

P.T.O.

Q4) Attempt the following:

a) Demonstrate Cohen-Sutherland line clipping algorithm. **[4]**

b) Differentiate between vector scan & raster scan display. **[4]**

c) What do you mean by scan conversion? **[2]**

Q5) Attempt the following:

a) State & explain DDA line algorithm. **[4]**

b) Explain beam penetration & shadow mask technique. **[4]**

c) List merits & demerits of plasma panel display. **[2]**

Q6) Attempt the following:

a) Explain Painter's algorithm. **[4]**

b) Explain Sutherland-Hodgman algorithm. **[4]**

c) What is fractal? State its types. **[2]**

Q7) Attempt the following:

a) Explain uniform & non-uniform b-splines. **[5]**

b) List & explain any two interpolative shading methods. **[5]**

Q8) Attempt the following:

a) Explain Scan Line algorithm. **[5]**

b) What are the 2 type of projections? Describe using figures. **[5]**

Total No. of Questions : 8]

SEAT No. :

P3390

[Total No. of Pages : 2

[4738] - 4002

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

CA - 402 : SDK

(2013 Pattern) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagrams must be drawn wherever necessary.***

Q1) Answer the following:

a) Explain Event Driven Programming and Sequence Driven Programming. **[4]**

b) Write a short note on Message Loop. **[4]**

c) Define Hit Test in mouse message. **[2]**

Q2) Answer the following:

a) Explain different types of GDI primitives. **[4]**

b) Write a short note on Mouse capturing. **[4]**

c) What do you mean by WM_DESTROY Message? **[2]**

Q3) Answer the following:

a) Explain Preemptive and non Preemptive Multitasking. **[4]**

b) Write a window procedure a cursor moving in the client area display the current co-ordinates in center of client area. **[4]**

c) What is keyboard Accelerator? **[2]**

P.T.O.

Q4) Answer the following:

a) Write a window procedure to create one push button label OK and CANCEL on the dialog box. **[4]**

b) What is Bitmap? Explain types of DIB. **[4]**

c) What do you mean handle? **[2]**

Q5) Answer the following:

a) What are the different types of windows header files? **[4]**

b) Write a short note on message queued. **[4]**

c) Explain any two ODBC API. **[2]**

Q6) Answer the following:

a) What is Timer? Explain different application of Timer. **[4]**

b) Write a short note on Mapping Mode. **[4]**

c) What is socket? **[2]**

Q7) Answer the following:

a) Write a window procedure to display rectangle in center of client area when you click the right button and erase everything from client area when you click a left button. **[5]**

b) Write a window procedure to display two push button '+' and '–', when '+' is pressed window size is increase, while it decrease if '–' is pressed. **[5]**

Q8) Answer the following: **[10]**

Write a Win SDK program that is menu driven having following menu item and supporting given functionality. [WinMain is not required]

List - Display the list box, name of cricket team.

Accept-Opens a dialog box to accept team info details.

[Use ODBC API].

Total No. of Questions : 8]

SEAT No. :

P3391

[Total No. of Pages : 2

[4738] - 4003

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

CA - 403 : ADVANCED JAVA

(2013 Pattern) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any Five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***

Q1) Attempt the following:

a) What is JDBC? Explain the architecture of JDBC in detail. **[4]**

b) Differentiate between Set and List Interface. **[4]**

c) Enlist implicit objects in JSP. **[2]**

Q2) Attempt the following:

a) What is internet addressing? Give the purpose of Inet Address class. **[4]**

b) Explain Servlet life cycle with help of suitable diagram. **[4]**

c) What are the advantages of using java beans. **[2]**

Q3) Attempt the following:

a) Write a note on Prepared Statement with example. **[4]**

b) Discuss the steps involved in creating the client & the server side of a socket. **[4]**

c) Describe Enumeration interface in brief. **[2]**

Q4) Attempt the following:

a) Explain Hashtable with an example. **[4]**

b) Explain URL connection class and its methods with an example. **[4]**

c) Write a short note on Cookie in servlet. **[2]**

P.T.O.

Q5) Attempt the following:

a) Give the use of following methods of Statement interface. **[4]**

i) executeQuery().

ii) executeUpdate().

b) What are the advantages of servlet over CGI? **[4]**

c) What is JSP? Explain its advantages and disadvantages. **[2]**

Q6) Attempt the following:

a) List & Explain the types of Servlets. **[4]**

b) Write a short note on session tracking. **[4]**

c) What are the different types of EJB? **[2]**

Q7) Attempt the following:

a) Write a JDBC application for the following form: **[5]**

First Name

Last Name

Password

Confirm Password

Submit Form I Reset Form I

On submit form button : Information should be stored in the database.

On Reset form : All the fields should be cleared.

Use, Table : Login (loginid varchar Primary Key, firstname varchar, lastname varchar,

Password varchar, confirmpassword varchar).

b) Write a session servlet program to create a form which accepts user information & find number of visits to the page. **[5]**

Q8) Attempt the following:

a) Write a program using JSP tags to compute Factorial of 1 to 10 numbers. **[5]**

b) Create a 3 page JSP Application for shopping cart. Last page must carry values from previous 2 pages & customer information. **[5]**

Total No. of Questions : 8]

SEAT No. :

P3392

[Total No. of Pages : 2

[4738] - 4004

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

CA - 404 : Object Oriented Software Engineering

(2013 Pattern) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any Five of the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt the Following:

a) Draw a use case diagram for online purchase from "*eBay*". **[4]**

b) Explain the Specialization with example. **[4]**

c) What is Object Orientation? **[2]**

Q2) Attempt the Following:

a) Draw Class diagram for online placement agency like Naukri.com. **[4]**

b) Explain Importance of UML. **[4]**

c) What is use of include relation in use case diagram? **[2]**

Q3) Attempt the Following:

a) Draw a sequence diagram for online Book Purchase form Amazon. **[4]**

b) Discuss importance and Principles of Modeling. **[4]**

c) Which are the elements of a Collaboration Diagram? **[2]**

Q4) Attempt the Following:

a) Draw object diagram for Mobile Application used for social networking (WhatsApp) which searches specified person/organization or group and chats as well as share images. **[4]**

b) Explain Test case Design. **[4]**

c) What is Unified Process? **[2]**

P.T.O.

Q5) Attempt the Following:

a) Draw State Transition diagram for Stack. **[4]**

b) Explain the concept of Resource Management Component. **[4]**

c) What are packages? **[2]**

Q6) Attempt the Following:

a) Draw a component and deployment diagram for online money transfer transaction foreshopping. **[4]**

b) Explain Realization with example. **[4]**

c) List the types of user acceptance testing. **[2]**

Q7) Attempt the Following:

a) Draw Use Case and Activity Diagram for mobile app '*Agro India*' helpful for farmers. It helps farmer to sell their crops at the best price available in the market with comparison to other registered dealer. It provides - Daily updates of leading crops, Crop wise list of dealers according to the region, crop quantity required and price associated to particular crop for the day by dealer. This application provide an ease to the farmer to sell his crop. **[5]**

b) Write short note on UP Phases. **[5]**

Q8) Attempt the Following:

a) A system is to be designed for students research program which includes different activities like Industrial Visits, Research Paper Writing, Presenting in Conferences, Publishing in Online Journals, Attending Student Conferences WorldWide, organizing Research activities etc. There are several groups with 4 to 5 candidates and one faculty guide as per the subject, who subjectively rate the performance of every student in a group for all activities and rates for the same. Draw Class and Collaboration diagram. **[5]**

b) Discuss Software Development Life Cycle. **[5]**

Total No. of Questions : 8]

SEAT No. :

P3393

[Total No. of Pages : 2

[4738] - 4005

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

CA-407 : CYBER LAW

(2013 Pattern) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any Five questions.***
2) ***Figures to the right side indicate full marks.***
3) ***Neat diagram must be drawn wherever necessary.***

Q1) Attempt the following:

a) Explain Cyber Crime in detail. **[4]**

b) Give a brief Description of Napster Case. **[4]**

c) What is mean by Denial of Service? **[2]**

Q2) Attempt the following:

a) Explain the following terms: **[4]**

i) Password Attack.

ii) Spyware.

b) Explain in detail Authentication of Electronic Record. **[4]**

c) What is mean by Computer Network? **[2]**

Q3) Attempt the following:

a) Explain Crime Cell in detail. **[4]**

b) Explain in detail Remedies for Infringement of copyright. **[4]**

c) Define Patents. **[2]**

P.T.O.

Q4) Attempt the following:

a) Explain Amendments to Indian penal code 1860 under sec. 470, 471, 477A, 499. **[4]**

b) Write a short note on Compensation and Adjudication. **[4]**

c) What is mean by copyright? **[2]**

Q5) Attempt the following:

a) Explain in detail Intellectual Property Right in Cyber Space. **[4]**

b) Explain Trade mark with the help of diagram. **[4]**

c) Define Case Solution. **[2]**

Q6) Attempt the following:

a) What are the rights in cyber space? **[4]**

b) Difference between Cyber Squatting and Typo Squatting. **[4]**

c) What is mean by framing? **[2]**

Q7) Attempt the following:

a) List and Explain Rules and Regulation of Electronic Gazette. **[5]**

b) Write the Preventive measures procedure. **[5]**

Q8) Attempt the following:

a) Explain Amendments to Indian evidence Act 1872 under sec. 85A, 85B, 88A, 90A. **[5]**

b) List and Explain factors which effect Legal recognition of Electronic records. **[5]**

Total No. of Questions : 8] SEAT No. :

P3395 [Total No. of Pages : 2

[4738] - 4007
M. C. A. (Science Faculty) (Semester - IV)
CA-409 : ARTIFICIAL INTELLIGENCE
(2013 Pattern) (Credit System)

Time : 3 Hours] *[Max. Marks : 50*

Instructions to the candidates:

1) ***Attempt any five of the following.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***

Q1) Attempt the following :

a) Explain with examples problem spaces, Search and Control Strategies in AI? **[4]**

b) Explain Problem Techniques in artificial intelligence. **[4]**

c) Define Artificial Intelligence? **[2]**

Q2) Attempt the following :

a) What is heuristic search? Explain Generate and Test Algorithm. **[4]**

b) Explain A* algorithm with Example. **[4]**

c) Solve the following cryptarithmatic problem.

CROSS + ROADS = DANGER **[2]**

Q3) Attempt the following :

a) Explain Learning by parameter adjustment. **[4]**

b) Write a note on Constraint Satisfaction with Example. **[4]**

c) What is Means-Ends Analysis? **[2]**

Q4) Attempt the following :

a) Explain MINIMAX method for Game Playing with Example. **[4]**

b) Write a note on Explanation based Learning. **[4]**

c) What is alpha-beta pruning? **[2]**

P.T.O.

Q5) Attempt the following :

a) Explain types of knowledge representation. **[4]**

b) Explain Knowledge representation requirements. **[4]**

c) What is Script and Frame? Give Example. **[2]**

Q6) Attempt the following :

a) What is predicate logic and how it is useful in AI state. **[4]**

b) Write brief notes on Semantic Network. Give examples. **[4]**

c) What is BFS? **[2]**

Q7) Attempt the following :

a) Describe the advantages of predicate logic over propositional logic. Represent each of the following sentences in first-order logic.

i) Ravi likes all kinds of food.

ii) Apples and Grapes are food.

iii) Ajay eats apple and is still alive. **[5]**

b) What is cut? Different types of Cut with the example using PROLOG program. **[5]**

Q8) Attempt the following :

a) Explain the structure of prolog program. Also explain how conversion from English to Prolog facts and Rules is performed? **[5]**

b) Explain rule, facts, predicate used in Prolog. **[5]**

Total No. of Questions : 5] **SEAT No. :**

P3245 **[Total No. of Pages : 3**

[4738] - 401
M.C.A. (Under Science Faculty)
CS - 401 : Introduction To Unix and Unix Internals
(2008 Pattern) (Semester - IV)

Time : 3 Hours] ***[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) What are the probable conditions explaining status of a buffer?

b) Give physical layout of Unix file system.

c) What is the use of remembered inode?

d) It is possible for some block numbers in an inode have the value 0, even though later blocks have nonzero value. If a process attempts to read data from such block, what happens?

e) What is tie-breaker rule.

f) Write a Pseudo-Code for context switch.

g) What are the advantages of having separate regions for text and data?

h) What are the contents of mount table entry?

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 kernel mode.

b) The kernel can lock and unlock an allocated inode independent of the value of the reference count.

c) Number of kernel context layer is bounded by interrupt layer.

d) A successful exec system call never returns.

e) The kernel always spawn or schedule a special process to handle interrups.

P.T.O.

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

a) What are advantages and disadvantages of buffer cache?

b) Explain how protection fault is handled in demand paging system.

c) Calculate Block number and byte offset into block for inode number 539. Assuming that block 2 is beginning of the inode list, each disk inode is of 64 byte and one disk block is of 1 KB.

d) What do you mean by process sleeping at interruptible priority? What is sleep address?

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

mount /dev/dskl /usr

cd /usr/src/uts

cd ../../..

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

a) Write a C program where parent and child process share a file.

b) Explain behaviour 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, l))==1)
{
      printf("char %c\n",c);
      skval=lseek(fd, 1023L, 1);
      printf("new seek val%d\n", skval);
} }
```

c) 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.

d) Write a shell script to accept a file name from user and check whether it is regular readable file or regular writable file or directory. Give appropriate message accordingly.

e) Explain behaviour of the following C program:

```
int globa
main( )
{
        int local;
        local = 1;
        if (vfork ( ) == )
                {
                        global = 2;
                        local = 3;
                        _exit( );
                }
        printf ("global %d local %d\n", global, local);
}
```

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

a) List all functions performed by clock interrupt handler.

b) Which system call is used to send signal to another process? Explain its usage.

c) Explain the data structures required for demand paging.

d) Explore various anomalies in the treatment of sleep.

e) Explain the various data structure (with suitable diagram) which gets updated after execution of Process A and Process B

```
Process A
        fdl = open("/etc/passwd",O_RDONLY);
        fd2 = open("/local",O_RDWR);
        fd3 = open("/etc/passwd",O_WRONLY);
Process B
        fd1 = open("/etc/passwd",O_RDONLY);
        fd2 = open("/private",O_RDONLY);
```

Total No. of Questions : 5]

SEAT No. :

P3246

[Total No. of Pages : 2

[4738] - 402

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

CS - 402 : Advanced Networking and Mobile Computing

(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 all : **[8 × 2 = 16]**

a) What are the functions of gateway GSN in GPRS?

b) Define the term OFDM.

c) What is Hard Handover?

d) What is Near and far Terminal problem?

e) What is the good code for CDMA?

f) What is fast retransmission in mobile transport layer?

g) What are the main drawbacks of spread spectrum?

h) Define the signal propagation?

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

a) Write a short note on Wireless transaction protocol.

b) Which type of different services does GSM offer? Give some examples and reasons why these services have been separated?

c) Write short note on congestion control.

d) Explain SMTP architecture.

e) What is difference between generic domain and inverse domain?

P.T.O.

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

a) Write a short note on WWW architecture.

b) Why is routing is multihop ad-hoc network is complicated?

c) Explain following terms

i) HLR

ii) VLR

iii) SIM

d) Why CSMA/CD fail in wireless transmission.

e) What is snooping? Explain drawbacks of snooping TCP.

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

a) How is localization, location update, roaming etc. done in GSM and reflected in the databases?

b) What is difference between FDMA and TDMA?

c) How care of address mechanism is used in mobile IP.

d) What improvement is needed in TCP for 2.5/3G network?

e) What is spread spectrum? Explain FHSS.

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

a) Write a short note on SMTP architecture.

b) What is tunneling? Explain advantages and disadvantage of reverse tunneling.

c) Name all the entities with their functionality in GSM.

d) Explain in brief WAP architecture.

e) What is UMTS? Explain the difference of UMTS and GSM.

Total No. of Questions : 4] SEAT No. :

P3247 [Total No. of Pages : 3

[4738] - 403

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 diagram must be drawn whenever necessary.***
3) ***All questions are compulsory.***

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

a) Explain shared disk multiprocessor system.

b) Which are the two major strategies for designing DDBS?

c) What is hybrid fragmentation?

d) State the objectives of query processing.

e) Define

i) Programming-in-the small.

ii) Programming-in-the large.

f) State different ways in which lock management is done.

g) State the four different alternatives for implementing LRM algorithms.

h) What is mean term selectivity and access frequency?

Q2) Attempt any four: **[4 × 5 = 20]**

a) Explain DDBS environment.

b) Discuss on the criteria, based on which the correctness of a derived fragmentation is decided.

c) Explain how normalization is done in query decomposition.

d) Explain deadlock avoidance scheme used in DDBMS.

e) Explain communication structure of distributed 2PL with the help of suitable diagram.

P.T.O.

Q3) Attempt any four: **[4 × 6 = 24]**

a) 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.

The matrix (A), given below, describe the attribute usage values and matrix (B) gives application access frequencies. Assume that $ref_i(q_k)=1$ for all q_k and S_i and that A1 is the key attribute. Do the vertical fragmentations of set of attributes using BE algorithm and vertical partitioning algorithm using matrix A and B.

Matrix (A)

	A1	A2	A3	A4	A5
q1	0	1	1	0	1
q2	1	1	1	0	1
q3	1	0	0	1	1
q4	0	0	1	0	0
q5	1	1	1	0	0

Matrix (B)

	S1	S2	S3
q1	10	20	0
q2	5	0	10
q3	0	35	5
q4	0	10	0
q5	0	15	0

b) Consider the following query.

Select person_name

from person p, disease d, person_disease pd

where p.pno=pd.pno and pd.dno=d.dno and disname='Swine Flu' and p.age<45;

Optimize the above query, using the INGRES query optimization algorithm for centralized query optimization.

c) Select ename

from emp, proj, asg

where emp.eno=asg.eno

and asg.pno=proj.pno

and pname= "CAD/CAM"

and dur=12 or dur=24 and sal>30000;

Convert the above query into an operator tree.

d) Assume the relation emp is fragmented as follows

emp1=σ eno<="E3" (emp)

emp2=σ "E3"<eno<="E6 (emp)

emp3=σ eno>"E6" (emp)

Assume the relation asg is fragmented as follows

asg1=σ eno<="E3" (asg)

asg2=σ eno>"E3" (asg)

For the following query draw the equivalent generic query tree and the reduced query tree. Also state the rules which are used.

Select*

from emp, asg

where emp.eno=asg.eno;

e) Consider the following schedule.

$S1=\{W_2(X),R_1(X),W_1(X),R_3(X),W_2(Y),R_3(Y),R_2(Z),R_3(Z)\}$

$S2=\{R_2(Z),W_2(X),W_2(Y),W_1(X),R_1(X),R_3(X),R_3(Z),R_3(Y)\}$

Explain whether S1 and S2 are serial or non-serial? And also check whether S1and S2 are serializable or not.

Q4) Attempt any four: **[4 × 5 = 20]**

a) Explain the role of Autonomy factor in DDBMS implementation alternative.

b) Write a note on different types of transactions.

c) What are 2PL, C2PL,P2PL and PC2PL?

d) Write a note on Basic To algorithm.

e) Explain strict replica control protocols.

Total No. of Questions : 4] SEAT No. :

P3248 [Total No. of Pages : 2

[4738] - 404
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) ***Neat diagrams must be drawn whenever necessary.***
3) ***Figures to the right indicate full marks.***

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

a) What is Unified Process?
b) What is Specialization?
c) What is Object Orientation?
d) What is use of include relation in use case diagram?
e) What are packages?
f) Which are the elements of deployment diagram?
g) State the use of polymorphism.
h) List the types of user acceptance Testing?

Q2) Attempt any four of the following: **[4 × 8 = 32]**

a) Draw class diagram and deployment diagram for Mobile Application used for social networking (Linked_ In) which searches specified person/ organization or group.
b) Draw use case diagram and activity diagram of "online passport system" for issue of new passport, cancellation for the same.
c) Draw State Transition and Activity Diagram for Stack.
d) Draw Object Diagram and Component diagram for Laptop Selection.
e) A system is to be designed for students research program which includes different activities like Industrial Visits, Research paper Writing, Presenting in conferences, Publishing in Online Journals, Attending Student Conferences WorldWide, organizing Research activities etc. There are several groups with 4 to 5 candidates and one faculty guide as per the subject, who subjectively rate the performance of every student in a group for all activities and rates for the same. Draw Use case Diagram and sequence diagram.

P.T.O.

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

a) Explain UML Architecture.

b) Draw sequence diagram for sending audio visual clip to a group of Whats-App Social Networking Application.

c) Write short note on Up Phases.

d) Discuss Software Development Life Cycle.

e) Explain the concept of concurrency and subsystem allocation.

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

a) Explain Realization with Example.

b) Draw a class Diagram for online money transfer Transaction on flip-kart E-Purchase.

c) Discuss importance and Principles of Modeling.

d) Explain Test case Design.

e) Draw a component and deployment diagram for Online Airline Reservation.

Total No. of Questions : 5] **SEAT No. :**

P3250 **[Total No. of Pages : 2**

[4738] - 502

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

CS - 502 : Internet Programming Using PHP

(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 rights indicate full marks.***

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

a) What does $PHP_SELF hold?

b) Explain unserialize & __ wakeup methods.

c) Explain the purpose of array-filter function.

d) What is natural order sorting of arrays? List the functions used for it.

e) Explain the function str-pad.

f) Explain the concept of "default parameters".

g) Explain the use of @-error suppression operator in PHP.

h) When can $-FILES array be used?

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

a) Differentiate between GET & POST methods.

b) Write a note on XML document structure.

c) Explain the functions used for approximate string equality.

d) Write a PHP script to create a base class person, derive the classes teacher & student from it & then apply introspection builtin constructs to find methods & properties of both.

e) Write a PHP script to read directory name and print all ".xml" files from that directory.

P.T.O.

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

a) Write a note on regular expressions.

b) Explain the process of sending email from a PHP script.

c) What is MIME? Also brief about multipart MIME.

d) Write a PHP script to accept marks of four subjects and calculate percentage & display grade of student. Use the concept of self processing form.

e) Write a php script to find intersection, set - difference & union of two arrays using built in functions.

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

a) Explain the function substr-replace with all possiblities i.e. insert, delete, overwrite, etc.

b) What is serialization? Explain the explicit & implicit functions used for it.

c) Explain any four functions for reading & writing file data.

d) Explain all the functions with suitable example for slicing and splitting array.

e) Write PHP script to accept student details on first page, student exam details on second page & print marksheet of student on third page.

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

a) Explain the concept of default parameters & variable parameters in PHP. List down the functions related to variable parameters.

b) What are sessions? How to deal with them in PHP?

c) What are anonymus functions? What is the other name with which they are identified? How to declare & use them?

d) Compare & contrast print-r & var-dump? Functions can echo construct be replaced by var-dump? why?

e) Write a PHP script to accept product name from user using the concept of sticky forms. Once user confirms the product name, print the message of accepting the order.

Total No. of Questions : 5] **SEAT No. :**

P3251 **[Total No. of Pages : 2**

[4738] - 503

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

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 all of the following : **[8 × 2 = 16]**

a) What is design pattern?

b) Give intent of proxy design pattern?

c) What are advantages of layered architectural pattern?

d) What is the intent of decorator design pattern?

e) State the structure of command design pattern.

f) Give examples of Abstract factory design pattern.

g) What are participants of broker architectural pattern?

h) What is an Idiom?

Q2) Attempt the following (Any Four) : **[4 × 4 = 16]**

a) What is pattern? What are pattern categories?

b) Explain MVC pattern?

c) State collaboration of strategy design pattern.

d) Explain stepwise refinement approach for layered architectural pattern?

e) Write a note on catalog organization of design pattern.

P.T.O.

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

a) State motivation and applicability of prototype design pattern.

b) Give intent & implementation issues of singleton design pattern.

c) What is Decorator Design pattern? What are the uses of it?

d) What are the benefits of Abstract factory design pattern?

e) Explain participants and collaboration of command design pattern.

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

a) Distinguish between structural and behavioural design pattern.

b) Explain proxy design pattern with the help of structure and participants.

c) Give structure of class and object of Adapter design pattern.

d) What are benefits of prototype design pattern?

e) Give 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 strengths and weakness of Decorator Design Pattern?

d) What are consequences of pipes & filters?

e) Explain counted pointer idioms with the steps of implementation.

Total No. of Questions : 5]

SEAT No. :

P3252

[Total No. of Pages : 2

[4738] - 504

MCA - III (Science faculty) (Semester - V)

CS - 505 : SOFTWARE TESTING AND QUALITY ASSURANCE

(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 indicate full marks.***

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

a) Explain software review.

b) Define stub.

c) What is Build in software testing.

d) What is the use of Run chart ?

e) Write objective of an Internal Audit.

f) What is loop testing ?

g) Define cyclomatic complexity.

h) Write attributes of a test case.

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

a) What is Basic path testing ?

b) What is graph Metric ? Explain

c) How to test real-time system ? Explain

d) What is regression testing ?

e) Explain strategies for software testing.

P.T.O

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

a) Explain Boundary Value analysis.

b) What is Unit testing ?

c) What is SQA plan ?

d) Explain six sigma in detail.

e) Explain software measurement principle in software metrics.

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

a) What is smoke testing ? Also discuss its benefits.

b) Explain Equivalence Partitioning.

c) What is brain storming in pareto analysis ?

d) What are the steps for deriving test cases ?

e) What are the characteristics of a good test ? Explain.

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

a) McCall's Quality factor.

b) Recovery testing.

c) Testing documents and help facilities.

d) ISO 9000 Quality standard.

e) Apache Jmeter

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