MCA (SEM-II) EXAMINATIONS - 2016
Object Oriented Programming

me: 2 Hours   **Max Marks:** 75

Write your Roll No. on the top immediately on receipt of the question paper.

Attempt ALL questions. Choices are given in each question set.

I.   **Attempt any TWO of the following:**   2x7=14

   (a)   What are structured and unstructured programming? Explain with the help of suitable examples.

   (b)   Define class, object and ADT and give their examples.

   (c)   Explain concept and advantages of Polymorphism and Inheritance.

2.   **Attempt any TWO of the following:**   2x7=14

   (a)   What are constructor and destructor? Explain with the help of suitable examples.

   (b)   Write a friend function that takes one data member from one class as an argument and other argument will be data member from other class and displays their sum.

   (c)   Write a program in C++ to demonstrate passing objects to a function and returning objects from a function.

3.   **Attempt any TWO of the following:**   2x7=14

   (a)   Explain with the help of suitable program segments the concept of pointers and references. Also, explain what is *this* pointer?

   (b)   How to allocate array dynamically? Explain. Also, explain use of **new** and **delete** operators with the help of suitable program segments.

   (c)   Give examples (program) of reference parameter and pointer parameter to a function and calling mechanism.

4.   **Attempt any TWO of the following:**   2x7=14

   (a)   Write a program to demonstrate binary operator * overloading with the help of multiplication of two matrices of order 3 X 3.

   (b)   Define function overloading. What are the various criteria for function overloading?

   (c)   What is copy constructor? Give an example. How to overload constructors?

5.   **Attempt any ONE of the following:**   1x10=10

   (a)   Write a program in C++ to demonstrate polymorphism? Also, explain the concept of **late** and **early** bindings.

   (b)   Explain the different type of inheritances. Write a program to implement multiple inheritances.

6.   **Attempt any ONE of the following:**   1x9=9

   (a)   What is exception handling? Explain. Write a program to implement the concept of exception handling.

   (b)   Using file handling feature of C++, read the contents of a given test file and display the same contents to the screen, also write them to a new file.

Code: CSC 623

MCA (SEM-II) EXAMINATIONS - 2016
Operating Systems

Roll No. 15Mc...2

Time: 2 Hours

Max Marks:

Time: 2 Hours
Write your Roll No.
Attempt all question
Attempt any TWO

- *Write your Roll No. on the top immediately on receipt of the question paper.*
- *Attempt all questions. Choices are given in each question set. Marks are indicated against each question.*

2x7=14

1. **Attempt any TWO of the following:**
   - (a) Differentiate between client-server computing, peer-to-peer computing and web-based computing.
   - (b) Illustrate a technique and its benefits in which, a single physical machine can run multiple operating systems concurrently.
   - (c) Describe various system calls related to process control management.

   2x7=14

2. **Attempt any TWO of the following:**
   - (a) Draw a tree of processes on a typical Solaris system, along with procedure of creation of processes and its children.
   - (b) Suggest a criteria for comparing CPU-scheduling algorithms.
   - (c) Consider the set of any four processes, with the length of the CPU burst (8, 4, 9, 5) and arrival time (0, 1, 2, 3) given in milliseconds. Draw a Gantt chart that illustrate the execution of these processes using shortest-remaining-time-first scheduling. Also, calculate turnaround time of each process.

   2x7=14

3. **Attempt any TWO of the following:**
   - (a) Provide the algorithms for producer and consumer processes in bounded buffer problem and show that they may not function correctly when executed concurrently. —
   - (b) Discuss the features used to characterize a deadlock situation.
   - (c) Is the following system of four processes with 2 resources and their instances deadlocked?

   Current allocation matrix

P1	1	3
P2	4	1
P3	1	2
P4	2	0

   Current request matrix

P1	1	2
P2	4	3
P3	1	7
P4	5	1

   Availability Vector

1	4

   2x7=14

4. **Attempt any TWO of the following:**
   - (a) Describe page-based virtual memory. You should consider pages, frames, page tables, and Memory Management Units in your answer.
   - (b) Consider the following page reference strings: 1, 2, 3, 4, 2, 1, 5, 6, 2, 1, 2, 3, 7, 6, 3, 2, 1, 2, 3, 6. How many page faults would occur for the LRU replacement algorithm, assuming four frames?
   - (c) Illustrate segmentation using suitable example.

   1x10=10

5. **Attempt any ONE of the following:**
   - (a) Discuss the operating system functions to perform the six basic file operations.
   - (b) Differentiate between sequential access and relative access methods for files and illustrate each with suitable example.

   1x9=9

6. **Attempt any ONE of the following:**
   - (a) Discuss the layered file system structure and its different components.
   - (b) What file organization would you choose to maximize efficiency in terms of speed of access, use of storage space, and ease of updating (adding/deleting/modifying) when the data are:
     - (i) Updated infrequently and accessed frequently in random order?
     - (ii) Updated frequently and accessed in it's entirely relatively frequently?
     - (iii) Updated frequently and accessed frequently in random order?

Max Marks: 75

Time: 2 Hours

Write your Roll No. on the top immediately on receipt of the question paper.
Attempt all questions. Choices are given in each question set.

Attempt any TWO of the following: 2x7=14

(a) Doubly linked list takes more space than singly linked list for storing one extra address. In what condition could be a doubly linked list be more beneficial than singly linked list? Write a program to carry out the following tasks on a doubly-linked list :
   (i) Insertion of a node at the end   (ii) Deletion of a desired node

(b) Write the algorithm to perform the following operations on a circular linked list of n nodes:
   (i) Insertion of node at the beginning   (ii) Deletion of the last node

(c) Write code for the function *radixsort (r,d)*, which sorts a given list into ascending order using radix sort technique. The radix r and number of digits d in the radix decomposition are input to your program. Trace the program with suitable inputs.

Attempt any TWO of the following: 2x7=14

(a) A lower triangular array A is an n-by-n array in which $A[i][j] == 0$, if $i<j$. What is the maximum number of non-zero elements in such an array? How can these elements be stored sequentially in memory? Develop an algorithm for accessing $A[i][j]$, where $i>=j$. Define an upper triangular array in an analogous manner and do the same for such an array as for the lower triangular array.

(b) A two-dimensional m x n array has mn elements.
   (i) Determine the amount of memory used when mn elements are stored using a two-dimensional array and when they are stored in a one-dimensional array using row-major mapping. Assume that the elements are of type int.
   (ii) How large can the ratio of the two memory requirements get?

(c) What is a Sparse Matrix? How sparse matrices can be represented efficiently in memory? Write a program to create a sparse Matrix S and to find its transpose.

Attempt any TWO of the following: 2x7=14

(a) Consider the a Stack ADT and write a program that includes functions to
   (i) Input a Stack
   (ii) Convert a Stack into a string suitable for output.
   (iii) Split a Stack into two stacks - the first containing the bottom half elements, and the second containing the remaining elements.

(b) Write an algorithm to convert an infix expression into its postfix equivalent. Convert the following infix expressions into its prefix and postfix expressions.
   (i) A + B – C   (ii) (A + B) * (C - D)   (iii) A $ B * C - D + E / F / (G + H)
   (iv) ((A + B) * C - (D - E)) $ (F + G)   (v) A - B/(C * D $ E)

(c) What is Heap? Write a program to implement Heap sort using arrays. Perform Heap Sort on the following list of integers: 23,5,47,58,4,52,15,48,26,3,11,4,7

Attempt any TWO of the following: 2x7=14

(a) What is a Skip List? How does it provide a better data structure as compared to Linked lists?

(b) Write the algorithm for the insertion and deletion operations on the skip list.

(c) What is Hashing? Write the algorithm to insert an item into a hash table with open addressing and linear probing.

Attempt any ONE of the following: 1x10=10

(a) Suppose a Binary Search Tree T is in the memory. Write recursive functions to perform the following tasks in the Binary Search Tree T:
   (i) To insert a node   (ii) To perform Preorder, Inorder and Postorder Traversals of nodes,

(b) What is an AVL Tree? Write an algorithm to insert a node in an AVL Tree? Explain the different types of rotation done in AVL tree. Trace the algorithm for the following key values: k,m,u,t,v,p

Attempt any ONE of the following: 1x9=9

(a) Describe three ways to implement a graph in computer memory.

(b) Explain the difference between depth-first and breadth-first traversal of a graph. What data structures are needed to keep the waiting vertices during (i) depth-first traversal and (ii) breadth-first traversal? Justify.

MCA (SEM-II) EXAMINATIONS - 2016
Computer System Architecture

Roll No. *1 5 M*

Time: 2 Hours

Max Marks

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt all questions. Choices are given in each question set. Marks are indicated against each question

1. **Attempt any TWO of the following:** 2x7=
   (a) What is Register Transfer Language? Describe memory transfer.
   (b) What do you mean by Register Transfer Operations? Discuss Instruction Representation.
   (c) What are shift Microoperation? Discuss Data-path Design.

2. **Attempt any TWO of the following:** 2x7=14
   (a) Convert the following arithmetic expression from reverse Polish notation to infix notation.
       (i) ABCDE+*-/ (ii) ABCDE*/-+ (iii) ABC*/D-EF/+ (iv) ABCDEFG+*+*+*+*

   (b) The 8-bit registers AR, BR, CR, and DR initially have the following values: AR=11110010, BR=11111111, CR=10111001, DR=11101010

   Determine the 8-bit values in each register after the execution of the following sequence of micro operations.

   (i) $AR \leftarrow AR + BR$ Add BR ton AR
   (ii) $CR \leftarrow CR \wedge DR, BR \leftarrow BR + 1$ AND DR to CR, increment BR
   (iii) $AR \leftarrow AR - CR$ Subtract CR from AR
   Also determine the value of c, s, z, v for each micro operation.

   (c) What is indirect addressing mode? Draw the diagram of indirect addressing mode. Write a program to evaluate the arithmetic statement : $Z = \dfrac{(x-y)*[y+z*(D+E)]}{(F+p)*(G+H)}$ Using
       (I)   General register computer with two address instructions.
       (II) An accumulator based computer with one address instructions.
       (III) Stack based computer with zero address instructions

3. **Attempt any TWO of the following:** 2x7=14
   (a) Show the step by step multiplication process using Booth algorithm when the following binary numbers are multiplied. Assume 5-bit registers that hold signed numbers. The multiplicand in both cases is +14.

       (I) (+14)x(+12)   (II) (+14)x(-12)

   (b) Write algorithm for unsigned Binary division. Using this algorithm divide −a by b, where a=-6 and b=3.
   (c) How can you form the negation of an integer in 2's complement representation?? Draw Flowchart for Unsigned Binary Multiplication and multiply 1110 x1001 using this flowchart.

4. **Attempt any TWO of the following:** 2x7=14
   (a) What do you mean by peripheral devices? Differentiate between strobe control and handshaking.
   (b) What is priority interrupt? Discuss memory mapped I/O.
   (c) What is memory bus? Explain DMA controller.

5. **Attempt any ONE of the following:** 1x10=10
   (a) What is memory hierarchy? Consider a two level memory hierarchy (M_1, M_2). M1 is directly connected to the CPU. Determine the average cost per bit (C) and the average access time(t_a) for the data given below:

Memory level	Capacity (S_i)	Cost (C_i)	Access Time (t_{ai})	Hit (H)
(M_1(Cache)	1024	0.1000	10^{-8}	0.9000
(M_2(Main)	2^{16}	0.0100	10^{-6}	

What cache memory? Explain the following:

    (i) Cache initialization

    (ii) Virtual memory

    (iii) Auxiliary memory

Attempt any ONE of the following:

1x9=9

(a)   What do you mean by vector processing? Consider the execution of a program of 15000 instructions by linear pipeline processor. The clock rate of pipeline is 25MHz. Pipeline has five stages and one instruction is issued per clock cycle. Neglect penalties due to branch instructions and out of sequence execution:

    (i) Calculate the speed up program execution by pipeline as compared with that by non-pipelined processor.

    (ii) What are the efficiency and throughput of the pipeline processor?

(b)   What is Array processor? Explain Instruction pipeline.

Code: CSC624

Roll No. ISMCA

MCA (SEM-II) EXAMINATIONS - 2016
Theory of Computation

Max Marks: 75

Time: 2 Hours

- Write your Roll No. on the top immediately on receipt of the question paper.
- Attempt all questions. Choices are given in each question set.

2x7=14

1. **Attempt any TWO of the following:**
   (a) For the given two sets X and Y with their cardinalities m and n respectively, determine the number of: (i) One-to-one functions from X to Y (ii) Onto functions from X to Y (iii) Relations from X to Y

   (b) Describe the various kinds of grammars, languages and their corresponding machines along with at least one example of each.

   (c) Design the Finite Automata for the language L= {|w| mod 4 ≠ 2}. Also design the Finite Automata which does not accept the string 1011 and trace your result also.

2. **Attempt any TWO of the following:**

   2x7=14

   (a) Obtain the regular expression over alphabet {0,1}, for the following:

   (i) Strings which always begin with 1 and end 0.

   (ii) Strings whose second symbol from the beginning is 1 and whose second symbol from the end is 0.

   (iii) Strings having atmost two occurrences of 00.

   (b) Prove that regular languages are closed under complementation, reversal, kleen star closure, concatenation, and union operations.

   (c) Prove that the language $L = \{ ww \mid w \in \{0,1\}^+ \}$, is not a regular language.

3. **Attempt any TWO of the following:**

   2x7=14

   (a) For the given grammars S → S+S | SS | (S) | S* | a ,with string (a+a)*, draw its parse tree and check for its ambiguity.

   (b) Describe the problems a CFG can suffer from? Explain how these problems can be overcome, by using some examples?

   (c) Define the normal forms of the CFG and the convert the following grammar into CNF:

   S→ABb|a, A→aaA| B, B→aAb

4. **Attempt any TWO of the following:**

   2x7=14

   (a) What do you mean by a PDA? Describe and compare the working of various kinds of PDAs.

   (b) Design the PDA for the language $L = \{ b^n a^m \mid n \le m \le 2n \}$

   (c) Prove the properties for which CFLs are closed and also prove the properties for which CFLs are not closed.

5. **Attempt any ONE of the following:**

   1x10=10

   (a) What do you mean by a Turing machines? Describe the language(s) which are dealt by Turing machines.

   (b) For the given alphabet $\Sigma \in \{1\}^+$, design the Turing machine for copying a string (w), i.e. $q_0 w \mid^* -- w w q_f$

6. **Attempt any ONE of the following:**

   1x9=9

   (a) Describe Computability, Decidability, Undecidability, Complexity classes and problem reduction with at least one example of each.

   (b) Describe the recursive functions with respect to Turing machine? Write the recursive function to obtain the X^Y operation and verify your result also.

MCA Semester-II Examination, 2015-16

<u>CSC622: (Data Structures Lab)</u>

IS MCA 0015

Set - B

Attempt all the questions:

1. Write program to carry out the following tasks in a singly-linked list :
   i. Insertion of a node at the end
   ii. Deletion of any node

2. Write a program to implement the *Radix sort* on an array of N strings.

MCA 2nd Semester 2015-16

Lab Examination (OOP with C++)   Time: 2.00 hrs

SET-II

Note: Attempt any TWO questions.

Q1. Write a program in C++ to demonstrate the concept of late binding (polymorphism) using the examples of Area of the different shapes (like Triangle, Rectangle, and Circle).

Q2. Write a program in C++ to demonstrate operator * overloading with the help of multiplication of two matrices of order 3 X 3.

Q3. Write a friend function that takes one data member from one class as an argument and other argument will be data member from other class and displays their sum.