Course Code: MCA-102	Course Name: Data and File Structures

Class Test - I

Time: 1 Hour   Max Marks: 20

A. *State true or false.*   *(0.5×5 = 2.5)*

(1)   An algorithm is an infinite set of instructions which, if followed, accomplish a particular task. [True] [False]

(2)   Two stacks can be implemented in a single array. [True] [False]

(3)   A binary tree with n internal nodes has exactly n - 1 external nodes. [True] [False]

(4)   In pre-order traversal method, the root node is visited last. [True] [False]

(5)   All levels in a heap must be full except last level, and the nodes must be filled from left to right strictly. [True] [False]

B. *Fill in the blanks with appropriate answer.*   *(0.5×5 = 2.5)*

(1)   … … … … … … … indicates the upper or highest growth rate that the algorithm can have.

(2)   Process of inserting a new element to the top of stack is called … … operation.

(3)   A binary tree in which all internal nodes have two children and all leaves are at same level, is called … … … … … … ….

(4)   … … … … … algorithm is used to find single source shortest path in a graph.

(5)   In … … … … file, records can only be accessed one after another from beginning to end.

C. *Choose the correct option.*   *(0.5×10 = 5)*

(1)   The function $f(n)=O(g(n))$ iff there exist positive constants c and n_0 such that
      a) $f(n) \leq c*g(n)$ for all n, $n \geq n_0$
      b) $f(n) = c*g(n)$ for all n, $n \geq n_0$
      c) $f(n) \geq c*g(n)$ for all n, $n \geq n_0$
      d) None of the above

(2)   Which of the following is a non-linear data structures?
      a) Stack
      b) Hash table
      c) Linked list
      d) Heap

(3) How many pointers need to be modified in inserting an element at the beginning of a linear linked list?

    a) 1
    b) 2
    c) 3
    d) 4

(4) Stack is also called known as

    a) LIFO
    b) FIFO
    c) SIPO
    d) None of the above

(5) If there are 27 nodes in a heap, what will be its height?

    a) 1
    b) 2
    c) 3
    d) 4

(6) The maximum number of nodes on level i of a binary tree is … … …

    a) i^2
    b) 2^i
    c) $2 + i$
    d) None of the above

(7) What can be the techniques to avoid collision?

    a) Make the hash function appear random
    b) Use the chaining method
    c) Use uniform hashing
    d) All of the mentioned

(8) Which of the following is a valid statement for a project having 3 paths: A – B - C with 25 days length, A – D – C with 15 days length, and A – E – C with 20 days length?

    a) The expected duration of this project is 60 days.
    b) The expected duration of the project is 25 days.
    c) A – B – C has the most slack.
    d) A – D – C is the critical path.

(9) Which of the following functions is used to read an integer from a file?

    a) getc()
    b) getw()
    c) fopen()
    d) fscanf()

(10) In 'C' programming, which of the following modes opens the file for reading and appending?

    a) a
    b) a+
    c) r
    d) r+

D. *Answer the following questions.* *(2×5 = 10)*

(1) List the advantages of doubly linked list over linear linked list. Design an appropriate data structure to represent the following polynomial.

$9x^3y^2 - 8x^2y^2 + 10xy + 3y^2$

(2) Identify the most appropriate notation for use in computers. Convert the following arithmetic expression to postfix notation.

A - B / (C * D ^ E)

(3) For a binary tree, the pre-order and in-order traversal sequences are as follows:

Pre-order: A, B, L, M, K, N, P, Q

In-order: L, B, M, A, N, K, Q, P

Draw the binary tree.

(4) Discuss how the height of a binary search tree affects its performance.

(5) The sequence 70, 15, 50, 5, 12, 35, 10 represents a max heap. Construct the heap after performing the following operations.

  a) Insertion of element 25

  b) Deletion from root

  c) Insertion of element 75