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MCS–021

MASTER OF COMPUTER APPLICATIONS/BACHELOR OF COMPUTER APPLICATIONS

(REVISED)

(MCA/BCA)

Term-End Examination

June, 2026

MCS-021 : DATA AND FILE STRUCTURES

Time : 3 Hours *Maximum Marks : 100*

Weightage : 75%

Note : *(i) Question no.* ***1*** *is compulsory.*

(ii) Attempt any ***three*** *questions from the rest.*

(iii) All algorithms should be written near to 'C' language.

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1. (a) Write an algorithm to compute the least common multiple of two positive integers. Calculate both time and space complexity for this algorithm. 10

   (b) Describe Breadth First Search algorithm with the help of a suitable example. 10

   (c) Write an algorithm to implement a sparse matrix using a linked list. Explain how addition operation can be performed on it. 10

   (d) Write an algorithm to implement a singly linked list. Also, discuss the differences between single linked list and doubly linked list. 10

2. (a) What is a self-balancing binary search tree ? How would you generate a self-balancing BST with nodes ? Explain with the help of an example. 10

   (b) What is a Queue ? Write algorithms for insert and delete operations in queue. 10

3. (a) Define a spanning tree and explain its properties. How does Kruskal's algorithm work to find a minimum spanning tree ? Explain with the help of an example. 10

   (b) What are the properties of a B-tree of order m ? Create a B-tree of order-3 for following list of items inserted in the order : 10

   5, 8, 35, 40, 25, 60, 4, 12

4. (a) Answer the following questions :

(i) Describe the linear search algorithm with the help of an example. Under what conditions would linear search outperform binary search ? 5

(ii) Prove by Induction that the number of nodes in full binary tree of height 'h' is equal to $2^{h+1} - 1$. 5

(b) What is Quick sort ? Apply Quick sort algorithm to sort the following list of elements : 10

35, 20, 5, 40, 10, 50, 15

5. (a) What are Red-Black trees ? Explain the properties of Red-Black Trees with suitable example. 10

   (b) What is indexed sequential file organization ? Explain how the indexed sequential file organization differs from the direct file organization. 10

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