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MCS–208

POST GRADUATE DIPLOMA IN COMPUTER APPLICATIONS (PGDCA–NEW)

Term-End Examination

December, 2024

MCS-208 : DATA STRUCTURES AND ALGORITHMS

Time : 3 Hours *Maximum Marks : 100*

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

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

(*iii*) *All Algorithms should be written nearer to 'C' language.*

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1. (a) What is hashing ? How is a hash function utilized to map data into a hash table ? Explain with an example. 10

(b) What is a time complexity of an algorithm ? What is a time-and-space trade-off ? Explain with the help of an example. 10

(c) Convert the following infix expression into postfix and prefix expressions : 10

$$(a * (b + c)) / (d - e)$$

(d) Write non-recursive algorithm for preorder traversal of a Binary tree. Also, explain the algorithm with the help of an example. 10

2. (a) What are circular linked lists ? What is the procedure for inserting a new node at the end of circular linked list ? 10

(b) Explain Sparse matrix. How are sparse matrices stored efficiently in the computer's memory ? Explain with the help of an example. 10

3. (a) What is a B-tree and what are its properties ? Create a B-tree of order 5, if the following list of keys are inserted into the empty B-tree in the order : 10

25, 10, 15, 28, 40, 30, 5, 2, 35, 42, 50

(b) What is a circular queue ? How does it differ from a queue ? Show insert and delete operations in a circular queue with the help of an example. 10

4. (a) Explain stack implementation using a linked list. 10

(b) Write an algorithm for Bubble sort. Sort the following set of data in ascending order using bubble sort. Show all steps of application of algorithm :

10, 5, 6, 7, 15, 8

Also, explain Best case, Average case and Worst case time complexities of bubble sort. 10

5. (a) Describe Dijkstra's algorithm for finding the shortest path in a weighted graph. How does it manage graph with negative edge costs ? Explain with the help of an example. 10

(b) Discuss the concept of AVL tree rotations and their role in balancing the tree. 10

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