

**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.*

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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