Reg. No. : | | | | | | | | | | | | |

Question Paper Code : 60288

M.C.A. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Elective

(Bridge Course)

BX 4001 – DATA STRUCTURES AND ALGORITHMS

(Regulations 2021)

Time : Three hours | Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define Abstract data type.
2. Write an algorithm to find the largest element in an array and find its time complexity.
3. Show the stack after each operation of the following sequence that starts with the empty stack: push(a), push(b), pop, push(c), push(d),pop.
4. Give the applications of Queue ADT.
5. Write an algorithm to insert an element into a singly linked list where elements are stored in descending order.
6. List the applications of circular linked list.
7. Write an algorithm to perform linear search and find its time complexity.
8. What is meant by hashing?
9. Define Binary tree and state its properties.
10. What is a graph? Give its types.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Explain array insertion, deletion and search operations using an example. (8)

(ii) Design an algorithm to find all the common elements in two sorted lists of numbers. For example, for the lists 2, 5, 5, 5 and 2, 2,3,5, 5, 7, the output should be 2, 5, 5. Find the maximum number of comparisons made by the algorithm if the lengths of the two given lists are m and n, respectively. (5)

Or

(b) (i) Explain asymptotic notations in detail. (5)

(ii) Write an algorithm to perform insertion sort. Derive the best case, worst case and average case time complexities of this algorithm. (8)

12. (a) Design a program to convert an infix expression to postfix expression. (13)

Or

(b) Explain Queue ADT. Write functions to insert and delete elements from a queue of integers. (13)

13. (a) Write functions to perform the following operations in a singly linked list– insertion at a given position, deletion of an element, search a key and display the contents of the linked list. (13)

Or

(b) Write functions to perform the following operations in a doubly linked list–insertion at a given position, deletion of an element, search a key and display the contents of the linked list. (13)

14. (a) (i) Write an algorithm to perform binary search and derive its time complexity. (6)

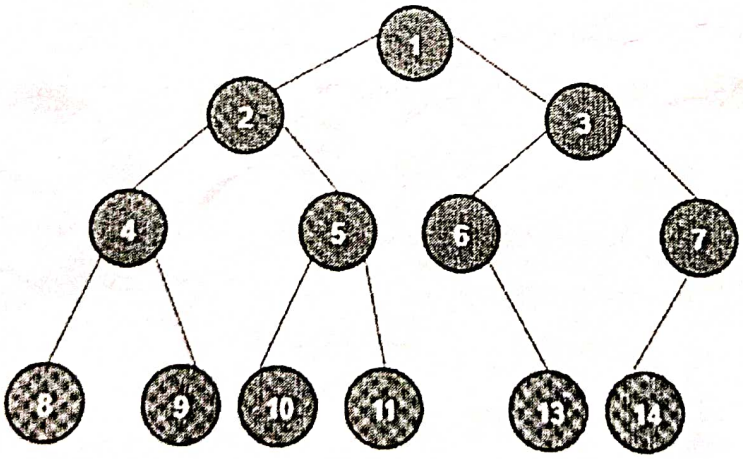
(ii) Explain separate chaining and open addressing in detail with examples. (7)

Or

(b) (i) Explain selection sort with an example and derive its time complexity. (7)

(ii) Compare the time and space complexities of bubble sort, insertion sort and selection sort. (6)

15. (a) (i) Define Binary tree and explain binary tree traversals using the given tree. (7)



(ii) Write an algorithm to search an element in the binary search tree. (6)

Or

(b) (i) Explain the different ways to represent Graph data structure. (6)

(ii) Discuss graph traversals with an example. (7)

PART C — (1 × 15 = 15 marks)

16. (a) Implement a circular queue and demonstrate insertion and deletion operations. Check the boundary conditions. (15)

Or

(b) (i) Write an algorithm to add to two polynomials using singly linked list. (7)

(ii) Write an algorithm to perform deletion of nodes in a binary search tree. (8)
