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

Question Paper Code : 20863

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2023.

Third Semester

Computer Science and Engineering

CS 3301 – DATA STRUCTURES

(Regulations 2021)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Define abstract data type.
2. Infer the usage of multilists.
3. Recall when an overflow and underflow condition occur during stack operations.
4. List some applications of queues.
5. Indicate the properties of binary tree.
6. Distinguish binary search tree and AVL tree.
7. Define B+ Tree with an example.
8. Express how a graph differs from a spanning tree with an example.
9. Distinguish internal and external sorting.
10. State hashing function.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Infer how lists and linked list are stored in memory with an example and write a function to check current position is last in a linked list. (7)

(ii) Distinguish circular linked list and doubly linked list during insertion and deletion operation. (6)

Or

(b) (i) Express an algorithm to add two polynomials having m and n terms respectively using linked list with an example. (7)

(ii) Explain how linked list are used for sorting the following set of numbers using radix sort. (6)

A = [432, 8, 530, 90, 88, 231, 11, 45, 677, 199]

12. (a) (i) Outline the pseudo-code for performing the following operations in stacks using array implementation. (8)

(1) Create (2) Push

(3) Pop (4) Stack Top

(ii) Identify how stacks are used for checking whether an expression is balanced or not for every right and left brace, bracket and parenthesis. (5)

Or

(b) (i) State the procedure for performing enqueue, dequeue, Isempty, and Isfull operations in a queue data structure with example data. (8)

(ii) Recognize the differences between circular queue and dequeue. (5)

13. (a) (i) Classify the three types of binary tree traversal and write the pseudo-code for in-order traversal with an example. (7)

(ii) Explain how a postfix expression is converted into an expression tree with an example. (6)

Or

(b) (i) Write the insertion algorithm for binary search tree and analyze its complexity. (7)

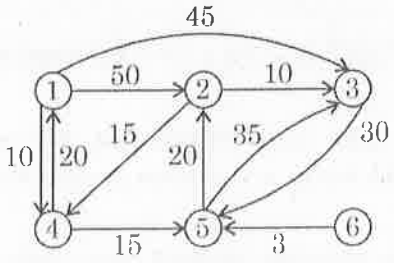
(ii) Summarize how rebalancing occurs in AVL trees during double rotation with an example. (6)

14. (a) (i) List the principles of B-trees and explain how a node can be inserted into a B-Tree with an example. (7)

(ii) Outline an algorithm for traversing a graph using breadth -first method with an example. (6)

Or

(b) (i) State dijkstra's algorithm and identify the minimum cost and shortest path for the following graph. (7)



(ii) Describe topological sorting with a pseudo-code. (6)

15. (a) (i) Defend how binary search logic is better than linear search with an algorithm and an example. (7)

(ii) Indicate the function for insertion sort with an example. (6)

Or

(b) (i) Write the merge sort algorithm and show how it arranges the following array of ten elements in sorted order. Analyze the complexity of the algorithm. (7)

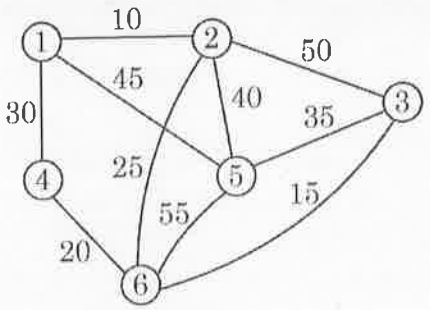
$A[1:10] = (31, 28, 17, 65, 35, 42, 86, 25, 45, 52)$.

(ii) Discuss about linear probing collision resolution technique with an example. (6)

PART C — (1 × 15 = 15 marks)

16. (a) (i) Demonstrate how minimum cost spanning tree can be obtained by Prim's method with an algorithm. (10)

(ii) Trace the above algorithm for the following graph and analyze the time and space complexity. (5)



Or

(b) (i) Convert the following infix expression to postfix expression with a neat sketch using stacks. (5)

$((A-(B+C)*D)\$(E+F))$.

$(A/(B-C+D))*(E-A)*C$

(ii) Devise an algorithm for evaluating the above postfix expression using stacks and analyze the complexity. (10)