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

Question Paper Code : 90410

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2022

Third/Sixth/Seventh/Eighth Semester

Computer Science and Engineering

CS 8391 – DATA STRUCTURES

(Common to : Computer and Communication Engineering/Electrical and Electronics Engineering/Electronics and Instrumentation Engineering/Instrumentation and Control Engineering/Information Technology)

(Regulations 2017)

Time : Three hours Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. What are abstract data types? Give examples.
2. How a circular list is advantageous over a linear list?
3. Define the operation 'pop' along with its necessary condition.
4. Write a pseudo-code to count the number of elements in a queue.
5. What are the ways in which the general trees are traversed?
6. When threaded binary trees are preferred?
7. Exemplify a weighted acyclic graph.
8. What is the property that makes an undirected graph as a bi-connected?
9. Write the procedure for bubble sort algorithm.
10. When do rehashing of a hash table be required?

PART B — (5 × 13 = 65 marks)

11. (a) Write procedures or pseudo codes for the following operations on a doubly linked list:

(i) Locating a data at $(n-2)^{th}$ node from nth node, (4)

(ii) Printing data in reverse order. (5)

(iii) Deleting the i^{th} node of the list. (4)

Or

(b) Implement Polynomial Addition using linear linked lists. Have functions for storing, traversing and adding any two potynomial expressions. (4+5+4)

12. (a) Explain the appropriate functions/pseudo-codes, the application of stacks in finding palindromes in a collections of strings. (8+5)

Or

(b) Write procedures for significant operations on a Queue data structure Q. Apply the Q to serve print jobs of your printer that receives multiple documents for printing. (9+4)

13. (a) Write a program to create a binary search tree (BST) for the following sequence of data items: 3, 1, 4, 9, 6, 5, 2, 8,7. Define a function to delete a node from the BST and then show the results of deleting the nodes 3, 2 and 7 one after the other of the constructed tree. (8+5)

Or

(b) (i) Illustrate the procedure for constructing an Expression tree for the expression: $(a+b)*c\hat{}d/e-(f+g)$. (8)

(ii) Exemplify the insertion operation in B+ trees, where there is an overflow in the leaf node. (5)

14. (a) (i) Explain the algorithm for topological sorting for the graph given in figure 14 – a. (9)

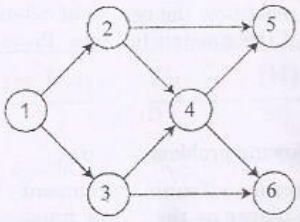

Figure : 14-a

(ii) Give the order of traversing the nodes of the graph given in figure: 14-a, when BFS algorithm is applied. (4)

Or

(b) (i) Give the adjacency list of the graph given in figure 14-b. (2)

(ii) Give the procedure to determine Euler circuit. (5)

(iii) Does the figure: 14-b has Euler circuit? (3)

(iv) Does it have any Euler path? If so, list. (3)

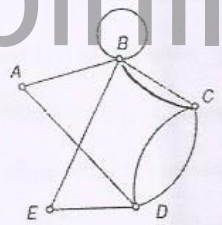

figure : 14-b.

15. (a) (i) Illustrate the Binary search algorithm with a suitable example. (6)

(ii) Trace the working of Selection sort algorithm on an un-ordered dataset of size 10. (7)

Or

(b) (i) How the size of hash table would be determined? Justify the reason for choosing a prime number to be the size of an hash table. (4)

(ii) Explain the open addressing and rehashing collision resolution strategies with appropriate examples. (9)

PART C — (1 × 15 = 15 marks)

16. (a) Construct an B+ tree by inserting 4, 1, 2, 5, 6, 17, 3, and 7 into an initially empty tree. Show the results of deleting the nodes 1, 6 and 7 one after the other of the constructed tree. Prove that the B+ tree is a self-balancing tree. (6+6+3)

Or

(b) Consider the following problem scenario:

In recording scores for a Tennis tournament - Singles, we enter the name and score of the player as the player finishes. This information is to be retrieved in each of the following ways:

(i) Scores and names can be printed in order by ascending or by descending scores.

(ii) Given the name of a player, other players with the same score can be printed

Give procedures by using the linked list data structure, for implementing a solution for the problem. (8+7)