

Data Structure & Program Design

P. Pages : 3

Time : Three Hours



NJR/KS/18/4434

Max. Marks : 80

- Notes :
1. All questions carry marks as indicated.
 2. Solve Question 1 OR Questions No. 2.
 3. Solve Question 3 OR Questions No. 4.
 4. Solve Question 5 OR Questions No. 6.
 5. Solve Question 7 OR Questions No. 8.
 6. Solve Question 9 OR Questions No. 10.
 7. Solve Question 11 OR Questions No. 12.
 8. Due credit will be given to neatness and adequate dimensions.
 9. Assume suitable data whenever necessary.

1. a) How to decide performance of an algorithm? Explain big O notation in brief. 5
- b) Sort the following array using selection sort. 5
Also specify its time complexity
80, 27, 42, 14, 69, 22, 85.
- c) Explain the Stability of an Algorithm for sorting. Give an example. 4

OR

2. a) Write an function to implement heap sort. 6
- b) Determine the frequency counts for all statements in the following program segments 4
- i) `i = 1;`
`while(i <= n)`
`{`
`x = x + 1;`
`i = i + 1;`
`}`
- ii) `for(i = 1; i <= n; i++)`
`{`
`for(j = 1; j <= i; j++)`
`{`
`for(k = 1; k <= j; k++)`
`{`
`x = x + 1`
`}`
`}`
`}`
- c) What do you mean by Divide and conquer strategy? Give suitable example for the same. 4
3. a) Write a procedure to check whether two linked list are equal or not. 5

- b) Draw generalized list for the following expression: 6
- i) $9x^2y^2 - 8xy^2 + 10xy + 9y^2$
- ii) $((x^{10} + 2x^8)y^3 + 3x^8y^2)z^2 + ((x^4 + 6x^3)y^4 + 2y)z$
- c) Discuss the methods of dynamic memory allocation. 3

OR

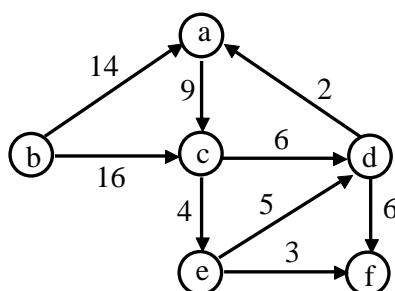
4. a) Give suitable representation for polynomials and write an algorithm to add two polynomials. 7
- b) Write a Menu Driven program for various operation of singly linked list. 7
5. a) Write short notes on **any two**. 8
- i) Multiple stacks.
- ii) Evaluation of postfix expression.
- iii) Circular Queue.
- b) Write PUSH and POP algorithm for implementing stack. 5

OR

6. a) Write an algorithm to evaluate a prefix expression using stacks. Explain it along with an example. 7
- b) How multiple queues are implemented using an array. Give pseudo code for insert and delete operations. 6
7. a) What is a Binary Search Tree? Explain & construct a BST from the following data: 5
- 43, 49, 09, 20, 33, 31, 02, 01, 57, 55
- b) Draw the tree, represented for the following prefix expression: 8
- i) $* a + b * c - de$
- ii) $B - C * D - E * F / K / L - F$
- iii) $* + abc / df$
- iv) $* + abc - df$

OR

8. a) What is an AVL tree? Explain with suitable example, how height is balanced in an AVL tree after a new insertion. 6
- b) Write short notes on threaded binary trees. 3
- c) Write an algorithm for Postorder traversal of Binary Tree (Non-recursive). 4
9. a) How many minimum spanning trees does the following graph have? Draw them. 7



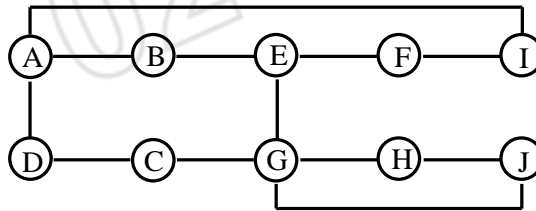
- b) Define the following.
- Complete graph.
 - Degree of graph.
 - Path of graph.
 - Strongly connected component.
 - Isolated vertex.
 - Hamiltonian path.

6

OR

10. a) Describe DFS algorithm. Find out the DFS traversal of the following graph starting at node A.

7



- b) Suppose graph is stored in memory. Write a non-recursive procedure for breadth. First search traversal of a graph.

6

11. a) Using Division method of hashing for a table of size 11, store the following numbers in a hash table
64, 98, 123, 200, 214, 193, 163, 201.

7

- b) What are the different collision handling mechanisms? Explain any two with suitable example.

6

OR

12. a) Explain the following collision handling techniques.

7

- Linear Probing.
- Quadratic probing.
- Double hashing.

- b) Give the following list of elements 22, 26, 89, 45, 12, 32, 90, 55, 69, 96 and the hash function :
(Index = key % 10).
Show the hash table. Use collision Resolution through Linear probing.

6
