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B.Tech. DEGREE EXAMINATION, MAY 2019
Fourth Semester

IT1009 – DATA STRUCTURES AND ALGORITHMS
(For the candidates admitted during the academic year 2013 – 2014 and 2014 – 2015)

Note:

- (i) **Part - A** should be answered in OMR sheet within first 45 minutes and OMR sheet should be handed over to hall invigilator at the end of 45th minute.
- (ii) **Part - B** and **Part - C** should be answered in answer booklet.

Time: Three Hours

Max. Marks: 100

PART – A (20 × 1 = 20 Marks)
Answer ALL Questions

1. Time complexity refers to
 - (A) Complexities involved in calculation
 - (B) Amount of time the program need to run to completion
 - (C) Complexities involved in the input of the program
 - (D) Complexities involved with the output of the program
2. Linked list is not suitable for
 - (A) Binary search
 - (B) Polynomial manipulation
 - (C) Bubble sort
 - (D) Exchange sort
3. The postfix expression $AB + CD *$ can be evaluated using
 - (A) Stack
 - (B) Tree
 - (C) Queue
 - (D) Linked list
4. Suppose you, want to delete the name that occurs before “Sai” in an alphabetical listing, which of the following DS would be most appropriate for this operation?
 - (A) Circular linked list
 - (B) Doubly linked list
 - (C) Linked list
 - (D) Queue
5. The data structure which is one ended is
 - (A) Queue
 - (B) Stack
 - (C) Tree
 - (D) Graph
6. Binary search algorithm employs the strategy of
 - (A) Divide and conquer
 - (B) Dynamic programming
 - (C) Greery
 - (D) Back tracking
7. To represent hierarchical relationship, which DS is suitable?
 - (A) List
 - (B) Stack
 - (C) Queue
 - (D) Tree
8. You have ‘n’ number of elements arranged in a tree structure, and now you are asked to print the elements in ascending order, the best way to do this is
 - (A) Recursive Inorder traversal
 - (B) BFS
 - (C) DFS
 - (D) Linear traversal using threaded binary tree

9. The operation of each element in the list is known as
 (A) Sorting (B) Merging
 (C) Inserting (D) Traversal
10. Which of the following sorting procedures is the slowest?
 (A) Quick sort (B) Heap sort
 (C) Shell sort (D) Bubble sort
11. A list of 'N' strings, each of length N, is sorted into lexicographic order using the merge sort algorithm. The worst case running time of this computation is
 (A) $O(n \log n)$ (B) $O(n^2 \log n)$
 (C) $O(n^2 + \log n)$ (D) $O(n^2)$
12. Which of the following case does not exist in complexity theory?
 (A) Best case (B) Worst case
 (C) Average case (D) Null case
13. Which of the following sorting methods would be most suitable for sorting a list which is already sorted?
 (A) Bubble sort (B) Selection sort
 (C) Insertion sort (D) Quick sort
14. Quick sort efficiency can be improved by adopted
 (A) Non recursive method (B) Insertion method
 (C) Tree search method (D) Selection method
15. What is the type of algorithm used in solving the 8 queens problem?
 (A) Greedy (B) Dynamic
 (C) Branch and bound (D) Back tracking
16. Sorting is not possible by using which of the following methods?
 (A) Insertion (B) Selection
 (C) Exchange (D) Deletion
17. Which of the following is true?
 (A) P is a subset of NP (B) NP is a subset of P
 (C) P and NP are equal (D) NP is a subset of NP hard
18. Minimum number of edges in a connected cyclic graph on 'n' vertices is
 (A) $n - 1$ (B) n
 (C) $n + 1$ (D) $n + 2$
19. There are several factors that affect the efficiency of lookup operations in a hash table, Which of the following is not one of those factors?
 (A) Number of elements stored in the hash table (B) Size of the elements stored in the hash table
 (C) Number of buckets in the hash tables (D) Quality of hash function
20. When there is no possibility to store data in primary storage, secondary storage is the solution. Which data structure is ideal for this situation is?
 (A) B-tree (B) AVL tree
 (C) BST (D) Binary Tree

PART – B (5 × 4 = 20 Marks)
 Answer ANY FIVE Questions

21. Write a routine to destroy the memory space allocated to linked list.
22. Write the condition to cheque queue full and queue empty for circular queue.
23. What is an expression tree? Draw the expression tree for $a * b * c + e / d$.
24. Write the properties of red black tree.
25. Explain the terms full binary tree and complete binary tree.
26. Define open hashing and closed hashing.
27. Write an algorithm to perform depth first search in an undirected graph.

PART – C (5 × 12 = 60 Marks)
 Answer ALL Questions

28. a. Explain the procedure for infix to postfix with the following arithmetic expression.
 $(a + b) \wedge c - (d * e) / f$
 (OR)
 b. Compare and contrast array and linked list DS for the following operations.
 (i) Node creation
 (ii) Insertion
 (iii) Deletion
 (iv) Search
29. a. Construct the binary search tree with the given data 28, 32, 12, 30, 11, 15, 9, 20. Delete 12, 11 and 28 in sequence.
 (OR)
 b. Write an algorithm for inorder, preorder and post order traversals with suitable example.
30. a. Construct a AVL tree and explain all the rotations with the given data
 48, 12, 9, 52, 68, 72, 54, 16, 22, 43, 38
 (OR)
 b. Construct a Splay tree for 9, 8, 7, 6, 5, 4, 3, 2, 1. Do splaying for 3, 5, 7 in sequence.
31. a. Write a routine to implement quick sort and explain with suitable example.
 (OR)
 b. Analyze the pros and cons of linear, quadratic and double hashing methods with respect to insert, delete and search operations.
32. a. Write an algorithm for Dijkstra's algorithm and explain with an example.
 (OR)
 b. Explain the Kruskal's algorithm for finding the minimum spanning tree in an undirected graph and analyze its running time.

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