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B.Tech. DEGREE EXAMINATION, DECEMBER 2022

Fifth Semester

18CSC361J – DESIGN AND ANALYSIS OF ALGORITHMS

(For the candidates admitted from the academic year 2020-2021 & 2021-2022)

Note:

(i) **Part - A** should be answered in OMR sheet within first 40 minutes and OMR sheet should be handed over to hall invigilator at the end of 40th minute.

(ii) **Part - B** should be answered in answer booklet.

Time: 2½ Hours

Max. Marks: 75

	Marks	BL	CO	PO

PART – A (25 × 1 = 25 Marks)

Answer **ALL** Questions

1. _____ is the maximum amount of time an algorithm takes to execute a specific set of inputs. | 1 | 1 | 1 | 4
   (A) Running time (B) Average case time complexity
   (C) Worst case time complexity (D) Best case time complexity

2. The worst case time complexity of quick sort is | 1 | 1 | 1 | 4
   (A) O (n) (B) O (1)
   (C) O (log n) (D) O (n^2)

3. Which among the following is not a characteristics of an algorithm? | 1 | 1 | 1 | 4
   (A) Definiteness (B) Error
   (C) Uniqueness (D) Input

4. The worst case time complexity of linear search is | 1 | 1 | 1 | 4
   (A) O (n) (B) O (1)
   (C) O (log n) (D) O (n log n)

5. The function $T(n) = 5n^2 + 2n + 6$ is | 1 | 2 | 1 | 4
   (A) O (n^2) (B) O (n)
   (C) O (n log n) (D) O (log n)

6. The time complexity of travelling salesman problem using branch and bound is | 1 | 2 | 2 | 4
   (A) O (n^2) (B) O (n^3)
   (C) O ($n^2 2^n$) (D) O (n)

7. The branch and bound technique can be applied only to _____ problems. | 1 | 2 | 2 | 4
   (A) Consistent (B) Logical
   (C) Optimization (D) Non-optimization

8. _____ is used to kill live nodes without generating their children's. | 1 | 2 | 2 | 4
   (A) Bounding function (B) Branch function
   (C) Back track function (D) Upper function

9. Which of the following is used to implement Dijkstra's algorithm? 1 2 2 4
   (A) Max priority queue (B) Stack
   (C) Circular queue (D) Min priority queue

10. Dijkstra's algorithm is an example for 1 1 2 4
   (A) Greedy algorithm (B) Branch and bound
   (C) Back tracking (D) Dynamic programming

11. What is the time complexity of Kruskal's algorithm? 1 2 3 4
   (A) O (log V) (B) O (e log V)
   (C) O (e^2) (D) O (V log e)

12. Kruskal algorithm is used to 1 1 3 4
   (A) Find minimum spanning tree (B) Find single source shortest path
   (C) Find all pair shortest path (D) Traverse the graph

13. Identity the true statement about Prim's algorithm. 1 2 3 4
   (A) It initializes with a vertex (B) It initializes with a edge
   (C) It initializes with a weight (D) It initializes with a forest

14. Which among the following indicates post-order traversal? 1 2 3 4
   (A) Left sub-tree, right sub-tree, root (B) Right sub-tree, left sub-tree, root
   (C) Root, left sub-tree, right sub-tree (D) Left sub-tree, root, light sub-tree

15. The data structure used for breadth first search is 1 2 3 4
   (A) Stack (B) Queue
   (C) Linked list (D) Tree

16. If the number of steps required to solve a problem is O (n^k) then the problem is said to be solved in 1 2 4 4
   (A) Non-polynomial time (B) Polynomial time
   (C) Infinite time (D) Exponential time

17. Identify the false statement 1 2 4 4
   (A) NP-complete problems are subclass of NP-hard (B) All NP-complete problems are NP-hard
   (C) All NP-hard problems are NP-complete (D) All NP-hard problems are not NP-complete

18. Non-deterministic algorithm consist of _____ stages. 1 1 4 4
   (A) 1 (B) 2
   (C) 3 (D) 4

19. _____ steps are required to prove a decision problem is NP-complete. 1 1 4 4
   (A) 1 (B) 2
   (C) 3 (D) 4

20. Which of the following problems is not NP complete? 1 2 4 4
   (A) Hamiltonian circuit (B) Bin packing
   (C) Partition problem (D) Halting problem

21. Randomized quick sort uses _____ algorithm design strategy. 1 2 5 4

(A) Back tracking (B) Greedy
(C) Dynamic (D) Divide and conquer

22. The auxiliary space complexity of randomized quick sort is 1 2 5 4

(A) O (1) (B) O (n)
(C) O (log n) (D) O (n log n)

23. The average time complexity of randomized quick sort is 1 2 5 4

(A) O (n log n) (B) O (n^2)
(C) O (n^2 log n) (D) O (n log n^2)

24. Assuming P ! = NP, which of the following is true? 1 2 5 4

(A) NP-complete = NP (B) NP-complete $\cap$ P = ϕ
(C) NP-hard = NP (D) P = NP-complete

25. Halting problem is an example for 1 2 5 4

(A) Decidable problem (B) Undecidable problem
(C) Complete problem (D) Trackable problem

PART – B (5 × 10 = 50 Marks) Marks BL CO PO

Answer **ALL** Questions

26. a. Solve the following recurrence relation using recursion tree method. 10 3 1 4

$T(n) = T(n-1) + \log n,\ T(1) = 0$

(OR)

b. Solve the following recurrence relation using substitution method. 10 3 1 4

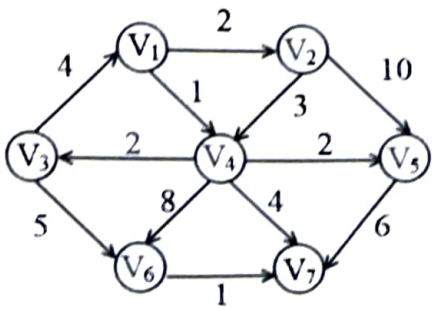
$T(n) = 2T(n-1) + 1,\ T(1) = 3$

27. a. Solve the 0-1 Knapsack problem using branch and bound and calculate the maximum profit obtained and items picked. 10 3 2 4

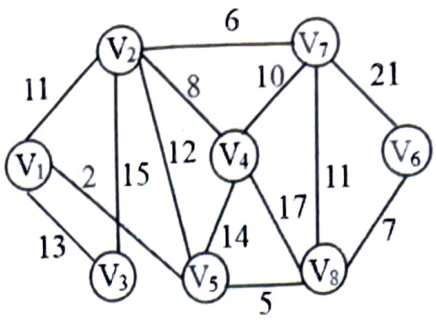
Items	Weight	Value
1	3	45
2	5	30
3	9	45
4	5	10

(OR)

b. Solve the single source shortest path from vertex V_1 in the below graph using Dijkstra's algorithm. 10 3 2 4



28. a. Compute the minimum cost spanning tree for the graph below using Prim's algorithm. 10 3 3 4



(OR)

b. Explain depth first search using relevant example and mention the algorithm. 10 3 3 4

29. a. Compare and contrast P and NP type problems with suitable example for each. 10 4 4 4

(OR)

b. How NP hard problems varies from NP complete problems? Justify your answer with suitable example for each. 10 4 4 4

30. a. Explain the advantages of using randomized quick sort compared to quick sort algorithm with respect to time complexity. 10 3 5 4

(OR)

b. Explain the working of randomized algorithm and approximation algorithm with suitable example for each. 10 3 5 4

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