2022/TDC(CBCS)/EVEN/SEM/ CSCHCC–403T/006

TDC (CBCS) Even Semester Exam., 2022

COMPUTER SCIENCE

(Honours)

(4th Semester)

Course No. : CSCHCC–403T

(Design and Analysis of Algorithms)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

SECTION—A

Answer any *ten* questions : 2×10=20

1. What do you mean by best case and average case complexities of an algorithm?

2. Check $5n^2 - 6n = \theta(n^2)$.

3. Write down the difference between greedy method and dynamic programming.

4. Compare bubble sort and insertion sort in terms of number of operations.

5. What is ideal sorting algorithm?

6. What is the complexity of quick sort?

7. What is lower bound theorem? Is lower bound a worst case?

8. What is the lower bound for comparison-based algorithms?

9. What are the types of balanced trees?

10. What is amortized analysis method?

11. How do you use amortized analysis algorithm?

12. What is meant by string matching?

13. What is minimum cost spanning tree?

14. What is cross-edge and back-edge in DFS tree?

15. What is the running time of BFS?

SECTION—B

Answer any *five* questions : 10×5=50

16. Define Big 'Oh', Theta and Omega notations as used in the analysis of algorithm. Bring out the differences among them with example. 10

17. Explain divide and conquer strategy with algorithm. Also, explain the computing time for divide and conquer strategy. 10

18. Illustrate the steps of the operation of HEAPSORT on the array

$A = (5, 13, 2, 25, 7, 17, 20, 8, 4)$

Also, explain the complexity of heapsort algorithm. 7+3=10

19. Write an algorithm for merge sort? Show that the computing time for merge sort is $O(n \log n)$. 5+5=10

20. Explain, with example, how lower bound theory is used to calculate a minimum number of comparisons required to execute an algorithm. 10

21. Explain red-black trees with examples. What is the best case complexity for the red-black tree? 7+3=10

22. Explain with example amortized analysis. How does amortized analysis differ from average case analysis? 7+3=10

23. Explain the Knuth-Morris-Pratt (KMP) algorithm for string matching. What is the matching time in KMP algorithm? 8+2=10

24. Write a pseudocode for breadth first search. Why is BFS used for shortest path? 7+3=10

25. Explain Kruskal's algorithm for minimum cost spanning tree. Also, mention the time complexity of Kruskal algorithm. 7+3=10

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