

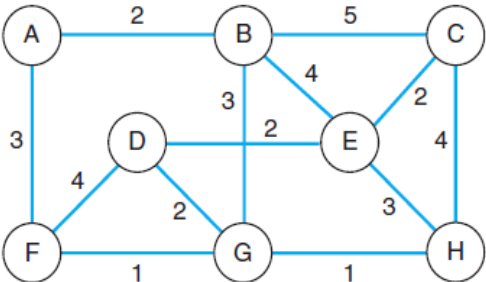
STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86
(For candidates admitted from the academic year 2023 – 2024 and thereafter)

M.Sc. DEGREE EXAMINATION, APRIL 2026
BRANCH I - MATHEMATICS
SECOND SEMESTER

COURSE : ELECTIVE
PAPER : ANALYSIS OF ALGORITHMS
SUBJECT CODE : 23MT/PE/AL15
TIME : 3 HOURS **MAX. MARKS: 100**

Q. No.	SECTION A ($5 \times 2 = 10$) Answer ALL questions	CO	KL
1.	What does big Oh represent?	1	1
2.	What are the two types of average-case analysis possible for a search algorithm? Explain briefly.	1	1
3.	How do we develop MergeLists in MergeSort algorithm?	1	1
4.	Define adjacency list for a graph G .	1	1
5.	Is $P = NP$? Justify.	1	1
Q. No.	SECTION B ($10 \times 1 = 10$) Answer ALL questions	CO	KL
6.	What is space complexity of an algorithm? (a) time taken by the algorithm (b) memory required by the algorithm as a function of input size (c) number of input values (d) number of operations performed	2	2
7.	In a decision tree, which path represents the worst case? (a) shortest path from the root to a leaf (b) longest path from the root to a leaf (c) any path from the root to a leaf (d) both (a) and (b)	2	2
8.	In binary search algorithm, when the target is smaller than the element at the middle location then _____ (a) start gets reset to 1 larger than the middle (b) end gets reset to 1 larger than the middle (c) start gets reset to 1 smaller than the middle (d) end gets reset to 1 smaller than the middle	2	2

9.	Which problem is solved using a selection algorithm? (a) finding maximum and minimum (b) finding the k -th largest element (c) sorting an array (d) searching an element	2	2
10.	Which of the following statements about Insertion Sort is TRUE? (a) it is not an in-place algorithm (b) it requires extra memory (c) it always take $O(n \log n)$ time (d) it always takes $O(n^2)$ time	2	2
11.	What is the worst-case time complexity of Merge Sort? (a) $O(n)$ (b) $O(n \log n)$ (c) $O(n^2)$ (d) $O(\log n)$	2	2
12.	The Knuth–Morris–Pratt algorithm is used for: (a) sorting strings (b) string matching (c) graph traversal (d) pattern compression	2	2
13.	The first step in Kruskal's algorithm is to: (a) select a random vertex (b) sort all edges in increasing order of weight (c) find the degree of each vertex (d) create an adjacency matrix	2	2
14.	If any NP-Complete problem is solved in polynomial time, then: (a) all NP problems can be solved in polynomial time (b) only that problem becomes easy (c) $P \neq NP$ (d) the problem remains NP-Hard	2	2

15.	In job sequencing with deadlines, each job is done : (a) variable processing time (b) more than one unit of time (c) zero time (d) one at a time	2	2
Q. No.	SECTION C ($2 \times 15 = 30$) Answer ANY TWO questions	CO	KL
16.	(i) Explain tournament method and draw the tournament tree for the values: 4, 6, 3, 2, 8, 7, 1, 5. (ii) Put the following recurrence relation into its closed form: $T(n) = \begin{matrix} 5 & \text{if } n \leq 4 \\ 4 T(n/2) - 1 & \text{otherwise} \end{matrix} \quad (7 + 8)$	3	3
17.	Write the binary search algorithm and discuss its average case.	3	3
18.	Discuss the procedure to split the list in QuickSort algorithm and hence obtain the PivotList algorithm. Also discuss its worst case.	3	3
19.	Apply Knuth-Morris-Pratt Algorithm to calculate the fail links for the pattern ABCABC.	3	3
Q. No.	SECTION D ($2 \times 15 = 30$) Answer ANY TWO questions	CO	KL
20.	Give sequential search algorithm and analyze its worst case and average case.	4	4
21.	Show the result of each pass of InsertionSort applied to the list [3, 5, 2, 9, 8, 1, 6, 4, 7].	4	4
22.	Explain Kruskal's algorithm and hence determine the same for the following graph. 	4	4

23.	Explain the following NP problems in both optimization and decision form (i) Graph Coloring (ii) Bin Packing (iii) Backpack Problem (iv) Subset Sum Problem (v) Job Scheduling Problem	4	4
Q. No.	SECTION E ($2 \times 10 = 20$) Answer ANY TWO questions	CO	KL
24.	Discuss the efficiency of recursive algorithm with an example.	5	5
25.	Explain FixHeap in HeapSort algorithm.	5	5
26.	Explain depth-first traversal and obtain the recursive algorithm for the same.	5	5
27.	Explain how to categorize NP complete problem as NP hard problem with an example.	5	5

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