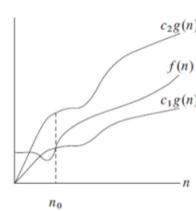


UNIT 1

Q1. Identify the notation in the graph:



a) $O(g(n))$
b) $\Theta(g(n))$
c) $\Omega(g(n))$
d) None of the above

Q2. What is the asymptotic relation between the functions $(n^3 \log_2 n)$ and $(3n \log_8 n)$?

a) $n^3 \log_2 n$ is $\Theta(3n \log_8 n)$
b) $n^3 \log_2 n$ is $\Omega(3n \log_8 n)$
c) $n^3 \log_2 n$ is $O(3n \log_8 n)$
d) All of the above

Q3. What is the time complexity of the following code?

```
int a = 0;
for (i = 0; i < N; i++) {
    for (j = N; j > i; j--) {
        a = a + i + j;
    }
}
```

a) $O(N)$
b) $O(N * \log(N))$
c) $O(N * \sqrt{N})$
d) $O(N * N)$

Q4. For an algorithm Y which is asymptotically less efficient than algorithm X, which of the following statements is true?

a) X will always be a better choice for small inputs
b) Y will always be a better choice for small inputs
c) X will always be a better choice for large inputs
d) X will always be a better choice for all inputs

Q5. What is the time and space complexity of the following code?

```
int a = 0, b = 0;
```

```

    a = v, v = v,
for (i = 0; i < N; i++) {
    a = a + rand();
}
for (j = 0; j < M; j++) {
    b = b + rand();
}

```



- a) O(N + M) time, O(1) space
- b) O(N * M) time, O(1) space
- c) O(N + M) time, O(N + M) space
- d) O(N * M) time, O(N + M) space

Q6. How is time complexity of an algorithm calculated?

- a) By counting the size of input data in the algorithm
- b) By counting the number of algorithms in an algorithm
- c) By counting the number of primitive operations performed by the algorithm on given input size
- d) None of the above



UNIT 2

Yashasvi

- Q.1) In analyzing Quicksort, which of the following is not true?
- (i) Quicksort is not a stable sorting algorithm
 - (ii) In Quicksort the size of the partitions depends on the pivot
 - (iii) Quicksort is a stable sorting algorithm
 - (iv) Quicksort can operate entirely within the given array: it is an in-place sort.



Q.2) Select the Right option from the following-

- a. In terms of storage straightforward algorithm is worse than the MAXMIN
- b. In terms of storage MAXMIN is worse than the straight forward algorithm
- c. In terms of storage both MAXMIN and straightforward algorithms are same
- d. It can't be determined

Q.3)

If $T(n)$ represents this number, then the resulting recurrence relation is

$$T(n) = \begin{cases} T(\lfloor n/2 \rfloor) + T(\lceil n/2 \rceil) + 2, & n > 2 \\ 1, & n = 2 \\ 0, & n = 1 \end{cases}$$

3a) Which of the following is the best, average and worst case number of comparison when the power of n is 2?

- a) $2n-2$
- b) $2n/3 - 2$
- c) $3n/2 - 2$
- d) $(3n-2)/2$



3b) To get the minimum and maximum of 260 numbers, the minimum number of comparisons required is

- a) 518
- b) 171
- c) 388
- d) 389

Q.4) Choose the false statement with respect to merge sort.

- a. Stack space is necessitated by the use of recursion

- b. The maximum depth of the stack is proportional to $\log n$
- c. The algorithm is devised in top down manner
- d. The algorithm is devised in bottom up manner**

Q.5) Which searching algorithm is significantly better than binary search in the worst case when input data is sorted?

- Linear Search
- Ternary Search
- c. Jump Search
- d. None of the above

Khushi

Q1) Assume that a mergesort algorithm in the worst case takes 70 seconds for an input of size 128. Which of the following most closely approximates the maximum input size of a problem that can be solved in 12 minutes?

- a.934
- B.1024
- C.512
- D.1134

Q2. Match the following sorting algorithms with their corresponding lowest worst-case time complexity.

Sorting Algorithm	Worst Case Time Complexity (with n inputs)
P. Merge Sort	a. $O(n^2)$
Q. Insertion Sort	b. $O(n\log n)$
R. Quick Sort	c. $O(n)$
	d. $O(n^2)$

- A. P-a, Q-b, R-c
- B. P-c, Q-a, R-b
- C. P-b, Q-a, R-d**
- D. P-b, Q-c, R-d

Q3) Choose the false statement with respect to minmax

- A. The number of comparisons of elements for best case is $3n/2$
- B. Advantage of finding maximum and minimum using divide and conquer method instead of using conditional operators is that it reduces space complexity.**
- C. The divide and conquer min max's time complexity can be defined as $O(n)$.
- D. Recurrence relation for the number of comparisons is $T(n) = 2T(n/2) + 2$

Q4. Let's assume that we are using quicksort to sort an array of 10 integers.

We have just finished the first partitioning and the array looks like:
 10 1 0 12 15 20 22 17 20

- A. The pivot could be 12, but not 15.
- B. The pivot could be either 12 or 15.**
- C. The pivot could be neither 12, nor 15
- D. The pivot could be 15, but not 12.



UNIT 3

Shiva



- [min]
1. Greedy algorithm (difficult question)

- [2 min]
2. Which is true about control abstraction?
 a. Taking away certain characteristics of code and reducing it into a minimum set of essential characteristics.
 b. Factoring how something works and focussing on the 'what'
 c. Reducing and simplifying a particular set of data into a simplified representation of the whole
 d. Process of hiding unwanted/irrelevant details from the end user.
 A) a and d
 B) d and c
C) b and a
 D) c and b
3. Huffman Codes
 a. [min]

4. asd
 [2 mins]
 5. What is the time complexity of Dijkstra's algorithm for the shortest path in a graph? How can the time complexity be reduced by modifying the input graph, and what will be the new time complexity after the modification?

- Options:
 A) $O(n^2)$, Adjacency list input graph, $O(E \log(n^2))$
 B) $O(n^2)$, List input graph, $O(\log n^2)$
C) $O(n^2)$, Adjacency list input graph, $O(E \log(n))$
 D) $O(n^2)$, list input graph, $O(E \log(n))$





Kulsoom

[1 min]

- Q.1) Knapsack problem aims to determine a combination where:
- A - Total weight of items should be less than or equal to capacity
 - B - Total value of items is as low as possible
 - C - Total weight of items should be more than or equal to capacity
 - D - Total value of items is as high as possible

- 1) A and D
- 2) B and C
- 3) A and B
- 4) None of the above

[2 min]

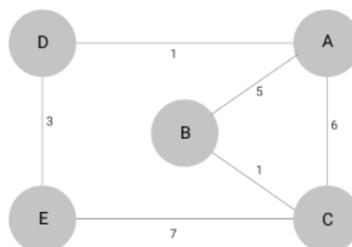
- Q.2) Select the correct answer



- 1) The time complexity of Prim's algorithm is $O(E \log V)$
- 2) To get the minimum distance, one node can be traversed more than once in Prims Algorithm
- 3) Kruskal's algorithm is more efficient in dense graphs and less efficient in sparse graphs
- 4) Initiation of Prim's algorithm happens at an edge

[2 min]

- Q.3) What will be the number of edges in the minimum spanning tree of the graph G shown below?



- 1) 6
- 2) 5
- 3) 4
- 4) 3

[3 min]

Q.4) Which option shows the correct Job sequence for the following table?

N = 5

Jobs	1	2	3	4	5
Profits	20	15	10	5	1
Deadlines	2	2	1	3	3

- 1) 1 -> 2 -> 4
- 2) 2 -> 1 -> 4
- 3) None of the above
- 4) Both

[4 min]

Q.5) Find the optimum solution of the knapsack problem by using greedy method:

Item	Weight	Value

1	2	2
2	6	3
3	1	8

- 1) If knapsack capacity was 10, the optimum value would be 13.
- 2) If knapsack capacity was 8, the optimum value would be 11.
- 3) If knapsack capacity was 5, the optimum value would be 12.5.
- 4) None of the above

