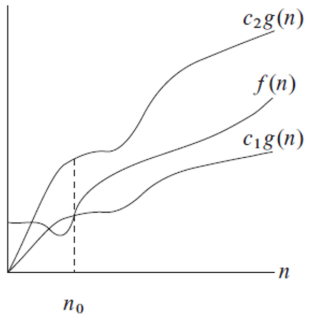
UNIT 1

Q1. Identify the notation in the graph:



a) *O (g (n))*
b) *Θ (g (n))*
c) *Ω (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;
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(nlogn)
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 isT(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:
4 8 1 9 12 15 39 28 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. Select the right combination of untrue statements of Huffman Codes.
    a. The character which occurs least frequently gets the smallest code.
    b. Used for loss-free compression of data.
    c. The character which occurs most frequently gets the largest code.
    d. The character which occurs most frequently gets the smallest code.
    e. Huffman Code implements the prefix rule.
    f. The character which occurs least frequently gets the largest code.
    g. Used for lossy compression of data.
    h. Huffman Code implements the postfix rule.

    A) b,e,a,f
    B) a,e,d,h
    C) d,b,e,a
    D) h,g,c,d

[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

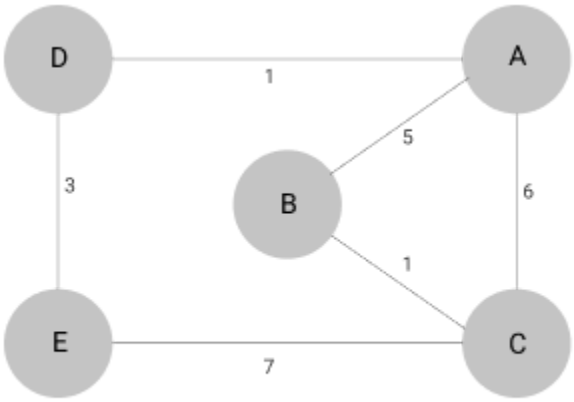
1) The time complexity of Prim's algorithm is O(E log V)

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