Question No: 1  (Marks: 1) - Please choose one
Random access machine or RAM is a/an  
► Machine build by Al-Khwarizmi  
► Mechanical machine  
► Electronics machine  
► Mathematical model

Question No: 2  (Marks: 1) - Please choose one
________________________ is a graphical representation of an algorithm  
► Σ notation  
► Θ notation  
► Flowchart  
► Asymptotic notation

Question No: 3  (Marks: 1) - Please choose one
A RAM is an idealized machine with ______________ random-access memory.  
► 256MB  
► 512MB  
► an infinitely large  
► 100GB

Question No: 4  (Marks: 1) - Please choose one
What type of instructions Random Access Machine (RAM) can execute? Choose best answer  
► Algebraic and logic  
► Geometric and arithmetic  
► Arithmetic and logic  
► Parallel and recursive

Question No: 5  (Marks: 1) - Please choose one
What will be the total number of max comparisons if we run brute-force maxima algorithm with n elements? http://vustudents.ning.com  
► $n^2$
Question No: 6 (Marks: 1) - Please choose one
What is the solution to the recurrence \( T(n) = T(n/2) + n \).

- \( O(log n) \)
- \( O(n) \)
- \( O(n \log n) \)
- \( O(n^2) \)

Question No: 7 (Marks: 1) - Please choose one
Consider the following code:
```
for (j=1; j<n; j++)
  for (k=1; k<15; k++)
    for (l=5; l<n; l++)
      {
        Do_something_constant();
      }
```
What is the order of execution for this code.

- \( O(n) \)
- \( O(n^3) \)
- \( O(n^2 \log n) \)
- \( O(n^2) \)

Question No: 8 (Marks: 1) - Please choose one
Consider the following Algorithm:
```c
Factorial (n){
  if (n=1)
    return 1
  else
    return (n * Factorial(n-1))
}
```
Recurrence for the following algorithm is:

- \( T(n) = T(n-1) + 1 \)
- \( T(n) = nT(n-1) + 1 \)
- \( T(n) = T(n-1) + n \)
- \( T(n) = T(n(n-1)) + 1 \)

Question No: 9 (Marks: 1) - Please choose one
What is the total time to heapify?

- \( O(\log n) \)
- \( O(n \log n) \)
Question No: 10  (Marks: 1) - Please choose one
When we call heapify then at each level the comparison performed takes time
► It will take $\Theta(1)$
► Time will vary according to the nature of input data
► It can not be predicted
► It will take $\Theta(\log n)$

Question No: 11  (Marks: 1) - Please choose one
In Quick sort, we don’t have the control over the sizes of recursive calls
► True
► False
► Less information to decide
► Either true or false

Question No: 12  (Marks: 1) - Please choose one
Is it possible to sort without making comparisons?
► Yes
► No

Question No: 13  (Marks: 1) - Please choose one
If there are $\Theta(n^2)$ entries in edit distance matrix then the total running time is
► $\Theta(1)$
► $\Theta(n^2)$
► $\Theta(n)$
► $\Theta(n \log n)$

Question No: 14  (Marks: 1) - Please choose one
For Chain Matrix Multiplication we can not use divide and conquer approach because,
► We do not know the optimum k
► **We use divide and conquer for sorting only**
► We can easily perform it in linear time
► Size of data is not given

Question No: 15  (Marks: 1) - Please choose one
The Knapsack problem belongs to the domain of ____________ problems.
► Optimization
► NP Complete
► Linear Solution
► Sorting
Question No: 16  (Marks: 1) - Please choose one

Suppose we have three items as shown in the following table, and suppose the capacity of the knapsack is 50 i.e. W = 50.

<table>
<thead>
<tr>
<th>Item</th>
<th>Value</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>10</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td>30</td>
</tr>
</tbody>
</table>

The optimal solution is to pick
- Items 1 and 2
- Items 1 and 3
- **Items 2 and 3**
- None of these

Question No: 17  (Marks: 2)

Describe an efficient algorithm to find the median of a set of 10^6 integers; it is known that there are fewer than 100 distinct integers in the set.

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Question No: 18  (Marks: 2)

How can we avoid unnecessary repetitions for recursive calls?

Question No: 19  (Marks: 2)

Draw the cost table for chain matrix multiplication problem with initial state.

Question No: 20  (Marks: 3)

Solve it,

\[ T(n) = \frac{1}{2} \sum_{q=1}^{2} (T(q - 1) + T(2 - q) + 2) \]
Question No: 21  ( Marks: 3 )
What are Catalan numbers? Give the formula.

Question No: 22  ( Marks: 5 )
What is the effect of calling Max-Heapify(A, i) when i > heap-size[A]/2?

Question No: 23  ( Marks: 5 )
Write the pseudo code for 0/1 knapsack algorithm developed using dynamic programming technique.