Question No: 1 (Marks: 1) - Please choose one
An optimization problem is one in which you want to find,
► Not a solution
► An algorithm
► Good solution
► The best solution (Page 97)

Question No: 2 (Marks: 1) - Please choose one
Although it requires more complicated data structures, Prim's algorithm for a minimum spanning tree is better than Kruskal's when the graph has a large number of vertices.

► True [click here for detail]
► False

Question No: 3 (Marks: 1) - Please choose one
If a problem is in NP, it must also be in P.
► True
► False
► unknown (Page 173)

Question No: 4 (Marks: 1) - Please choose one
What is generally true of Adjacency List and Adjacency Matrix representations of graphs?
► Lists require less space than matrices but take longer to find the weight of an edge (v1,v2)
► Lists require less space than matrices and they are faster to find the weight of an edge (v1,v2)
► Lists require more space than matrices and they take longer to find the weight of an edge (v1,v2)
► Lists require more space than matrices but are faster to find the weight of an edge (v1,v2)
[click here for detail]
Question No: 5  (Marks: 1) - Please choose one
If a graph has $v$ vertices and $e$ edges then to obtain a spanning tree we have to delete
- $v$ edges.
- $v - e + 5$ edges
- $v + e$ edges.
- None of these

Question No: 6  (Marks: 1) - Please choose one
Maximum number of vertices in a Directed Graph may be $|V^2|$
- True
- False  [click here for details]

Question No: 7  (Marks: 1) - Please choose one
The Huffman algorithm finds a (n) __________ solution.
- Optimal  [click here for detail]
- Non-optimal
- Exponential
- Polynomial

Question No: 8  (Marks: 1) - Please choose one
The Huffman algorithm finds an exponential solution
- True
- False

Question No: 9  (Marks: 1) - Please choose one
The Huffman algorithm finds a polynomial solution
- True
- False

Question No: 10  (Marks: 1) - Please choose one
The greedy part of the Huffman encoding algorithm is to first find two nodes with larger frequency.
- True
- False  (Page 100)

Question No: 11  (Marks: 1) - Please choose one
The codeword assigned to characters by the Huffman algorithm have the property that no codeword is the postfix of any other.
- True  (Page 101)
- False

دمائشسین رپے مشکل کم ڈی ایس اور رپے آسان کم رو سر چئس کہ تھی گر تکر کر

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Question No: 12  (Marks: 1)  - Please choose one
Huffman algorithm uses a greedy approach to generate a postfix code $T$ that minimizes the expected length $B(T)$ of the encoded string.
   ▶ True  (Page 102)
   ▶ False

Question No: 13  (Marks: 1)  - Please choose one
Shortest path problems can be solved efficiently by modeling the road map as a graph.
   ▶ True  (Page 153)
   ▶ False

Question No: 14  (Marks: 1)  - Please choose one
Dijkstra’s single source shortest path algorithm works if all edges weights are non-negative and there are negative cost cycles.
   ▶ True  (Page 159)
   ▶ False

Question No: 15  (Marks: 1)  - Please choose one
Bellman-Ford allows negative weights edges and negative cost cycles.
   ▶ True  (Page 159)
   ▶ False

Question No: 16  (Marks: 1)  - Please choose one
The term “coloring” came from the original application which was in architectural design.
   ▶ True  (Page 176)
   ▶ False

Question No: 17  (Marks: 1)  - Please choose one
In the clique cover problem, for two vertices to be in the same group, they must be adjacent to each other.
   ▶ True  (Page 176)
   ▶ False

Question No: 18  (Marks: 1)  - Please choose one
Dijkstra’s algorithm is operates by maintaining a subset of vertices
   ▶ True  (Page 155)
   ▶ False

Question No: 19  (Marks: 1)  - Please choose one
The difference between Prim’s algorithm and Dijkstra’s algorithm is that Dijkstra’s algorithm uses a different key.
   ▶ True  (Page 156)
   ▶ False
Question No: 20  (Marks: 1) - Please choose one
Consider the following adjacency list:

Which of the following graph(s) describe(s) the above adjacency list?
Question No: 21 (Marks: 1) - Please choose one
We do sorting to,
► keep elements in random positions
► keep the algorithm run in linear order
► keep the algorithm run in (log n) order
► keep elements in increasing or decreasing order (Page 40)

Question No: 22 (Marks: 1) - Please choose one
After partitioning array in Quick sort, pivot is placed in a position such that
► Values smaller than pivot are on left and larger than pivot are on right (Page 48)
► Values larger than pivot are on left and smaller than pivot are on right
► Pivot is the first element of array
► Pivot is the last element of array

Question No: 23 (Marks: 1) - Please choose one
Merge sort is stable sort, but not an in-place algorithm
► True (Page 54)
► False

Question No: 24 (Marks: 1) - Please choose one
In counting sort, once we know the ranks, we simply _________ numbers to their final positions in an output array.
► Delete
► copy (Page 57)
► Mark
► arrange

Question No: 25 (Marks: 1) - Please choose one
Dynamic programming algorithms need to store the results of intermediate sub-problems.
► True (Page 75)
► False
Question No: 26 (Marks: 1) - Please choose one
A $p \times q$ matrix $A$ can be multiplied with a $q \times r$ matrix $B$. The result will be a $p \times r$ matrix $C$. There are $(p \cdot r)$ total entries in $C$ and each takes ________ to compute.

- $O(q)$ (Page 84)
- $O(1)$
- $O(n^2)$
- $O(n^3)$

Question No: 1 (Marks: 1) - Please choose one
___________ is a graphical representation of an algorithm

- $\Sigma$ notation
- $\Theta$ notation
- Flowchart Click here for detail
- Asymptotic notation

Question No: 2 (Marks: 1) - Please choose one
Which of the following is calculated with big o notation?

- Lower bounds
- Upper bounds (Page 25)
- Both upper and lower bound
- Medium bounds

Question No: 3 (Marks: 1) - Please choose one
Merge sort makes two recursive calls. Which statement is true after these recursive calls finish, but before the merge step?

- The array elements form a heap
- Elements in each half of the array are sorted amongst themselves click here 4 detail
- Elements in the first half of the array are less than or equal to elements in the second half of the array
- None of the above
Question No: 4 (Marks: 1) - Please choose one
Who invented Quick sort procedure?

► Hoare  
► Sedgewick  
► Mellroy  
► Coreman

Question No: 5 (Marks: 1) - Please choose one
What is the solution to the recurrence $T(n) = T(n/2) + n$, $T(1) = 1$

► O(logn)  
► O(n) (Page 37)  
► O(nlogn)  
► O(2n)

Question No: 6 (Marks: 1) - Please choose one
Consider the following Huffman Tree
The binary code for the string TEA is

► 10 00 010  
► 011 00 010  
► 10 00 110  
► 11 10 110

Question No: 7 (Marks: 1) - Please choose one
A greedy algorithm does not work in phases.

► True  
► False (Page 97)

Question No: 8 (Marks: 1) - Please choose one
Can an adjacency matrix for a directed graph ever not be square in shape?

► Yes  
► No

Question No: 9 (Marks: 1) - Please choose one
One of the clever aspects of heaps is that they can be stored in arrays without using any___________.

► Pointers (Page 40)  
► constants  
► variables  
► functions
Question No: 10 (Marks: 1) - Please choose one
Merge sort requires extra array storage,

► True (Page 54)
► False

Question No: 11 (Marks: 1) - Please choose one
Non-optimal or greedy algorithm for money change takes___________

► O(k) (Page 99)
► O(kN)
► O(2k)
► O(N)

Question No: 12 (Marks: 1) - Please choose one
The Huffman codes provide a method of encoding data ineficiently when coded using ASCII standard.

► True
► False (Page 99)

Question No: 13 (Marks: 1) - Please choose one
Using ASCII standard the string abacdaacac will be encoded with__________ bits.

► 80 (Page 99)
► 160
► 320
► 100

Question No: 14 (Marks: 1) - Please choose one
Using ASCII standard the string abacdaacac will be encoded with 160 bits.

► True
► False (Page 99)

Question No: 15 (Marks: 1) - Please choose one
Using ASCII standard the string abacdaacac will be encoded with 320 bits.

► True
► False (Page 99)

Question No: 16 (Marks: 1) - Please choose one
Using ASCII standard the string abacdaacac will be encoded with 100 bits.

► True
► False (Page 99)
Question No: 17 (Marks: 1) - Please choose one
Using ASCII standard the string abacdaacac will be encoded with 32 bytes

► True
► False (Page 99)

Question No: 18 (Marks: 1) - Please choose one
The greedy part of the Huffman encoding algorithm is to first find two nodes with smallest frequency.

► True (Page 100)
► False

Question No: 19 (Marks: 1) - Please choose one
The greedy part of the Huffman encoding algorithm is to first find two nodes with character frequency

► True
► False (Page 100)

Question No: 20 (Marks: 1) - Please choose one
Huffman algorithm uses a greedy approach to generate an antefix code T that minimizes the expected length B(T) of the encoded string.

► True
► False (Page 102)

Question No: 21 (Marks: 1) - Please choose one
Depth first search is shortest path algorithm that works on un-weighted graphs.

► True
► False (Page 153)

Question No: 22 (Marks: 1) - Please choose one
Dijkstra's single source shortest path algorithm works if all edges weights are non negative and there are no negative cost cycles.

► True (Page 159)
► False

Question No: 23 (Marks: 1) - Please choose one
Dijkstra's single source shortest path algorithm works if all edges weights are negative and there are no negative cost cycles.

► True
► False (Page 159)
Question No: 24 (Marks: 1) - Please choose one
Floyd-Warshall algorithm is a dynamic programming algorithm; the genius of the algorithm is in the clever recursive formulation of the shortest path problem.

► True (Page 162)
► False

Question No: 25 (Marks: 1) - Please choose one
Floyd-Warshall algorithm, as in the case with DP algorithms, we avoid recursive evaluation by generating a table for

► k
► $d_{ij}^k$ (Page 164)
► True
► False

Question No: 26 (Marks: 1) - Please choose one
The term coloring came from the original application which was in map drawing.

► True (Page 176)
► False

Question No: 27 (Marks: 1) - Please choose one
In the clique cover problem, for two vertices to be in the same group, they must be______________each other.

► Apart from
► Far from
► Near to
► Adjacent to (Page 176)

Question No: 28 (Marks: 1) - Please choose one
Fixed-length codes may not be efficient from the perspective of _______the total quantity of data.
Select correct option:

► Minimizing (Page 99)
► Averaging
► Maximizing
► Summing
Question No: 29 ( Marks: 1 ) - Please choose one
In greedy algorithm, at each phase, you take the________ you can get right now, without regard for future consequences.

► Worst
► Minimum
► Good
► Best  (Page 97)

Question No: 30 ( Marks: 1 ) - Please choose one
The difference between Prim s algorithm and Dijkstra s algorithm is that Dijkstra s algorithm uses a same key.

► True
► False  (Page 156)

FINALTERM EXAMINATION
Spring 2007
CS502- Fundamentals of Algorithms (Session - 4)

Question No: 1 ( Marks: 1 ) - Please choose one
If a problem is in NP-complete, it must also be in NP.

► True (Page 178)
► False

Question No: 2 ( Marks: 1 ) - Please choose one
If there are n items, there are _______ possible combinations of the items.

► 2
► n
► 2^n (Page 92)
► 3^n

Question No: 3 ( Marks: 1 ) - Please choose one
Using ASCII code, each character is represented by a fixed-length code word of _______ bits per character.

► 4
► 6
► 8 (Page 99)
► 10
Question No: 4 (Marks: 1) - Please choose one
In Knapsack Problem, the thief’s goal is to put items in the bag such that the ______ of the items does not exceed the limit of the bag.

► Value (Page 91)
► Weight
► Length
► Balance

Question No: 5 (Marks: 1) - Please choose one
The knapsack problem does not belong to the domain of optimization problems.

► True
► False (Page 91)

Question No: 6 (Marks: 1) - Please choose one
In Huffman encoding, for a given message string, the frequency of occurrence (relative probability) of each character in the message is determined last.

► True
► False (Page 100)

Question No: 7 (Marks: 1) - Please choose one
Fixed-length codes are known for easy break up of a string into its individual characters.

► True (Page 99)
► False

Question No: 8 (Marks: 1) - Please choose one
In ______ Knapsack Problem, limitation is that an item can either be put in the bag or not-fractional items are not allowed.

► 0
► 1
► 0/1 (Page 91)
► Fractional

Question No: 9 (Marks: 1) - Please choose one
The term “coloring” came from the original application which was in architectural design.

► True
► False (Page 173)
Question No: 10 (Marks: 1) - Please choose one
In Knapsack Problem, value and weight both are to be under consideration.
► True (Page 91)
► False

Question No: 11 (Marks: 1) - Please choose one
Time complexity of DP based algorithm for computing the minimum cost of chain matrix Multiplication is ________.
► log n
► n
► n^2
► n^3 (Page 90)

Question No: 12 (Marks: 1) - Please choose one
In DP based solution of knapsack problem, to compute entries of V we will imply a/an _______ approach.
► Subjective
► Inductive (Page 93)
► Brute force
► Combination

Question No: 13 (Marks: 1) - Please choose one
A greedy algorithm sometimes works well for optimization problems.
► True (Page 97)
► False

Question No: 14 (Marks: 1) - Please choose one
In Huffman encoding, frequency of each character can be determined by parsing the message and __________ how many times each character (or symbol) appears.
► Printing
► Incrementing
► Counting (Page 100)
► Deleting

Question No: 15 (Marks: 1) - Please choose one
Greedy algorithm can do very poorly for some problems.
► True (Page 97)
► False
Question No: 16 (Marks: 1) - Please choose one
The Huffman codes provide a method of ________ data efficiently.
► Reading
► Encoding (Page 99)
► Decoding
► Printing

Question No: 17 (Marks: 1) - Please choose one
In _______ based solution of knapsack problem, we consider 2 cases, Leave object Or Take object.
► Brute force
► Dynamic programming (Page 93)

Question No: 18 (Marks: 1) - Please choose one
Those problems in which Greedy finds good, but not always best is called a greedy_______.
► Algorithm
► Solution
► Heuristic (Page 97)
► Result

Question No: 19 (Marks: 1) - Please choose one
In brute force based solution of knapsack problem, we consider 2 cases, Leave object Or Take object.
► TRUE
► FALSE (Page 97)

Question No: 20 (Marks: 1) - Please choose one
_______ problem, we want to find the best solution.
► Minimization
► Averaging
► Optimization (Page 97)
► Maximization

Question No: 21 (Marks: 1) - Please choose one
Using ASCII standard the string abacdaacac will be encoded with 10 bytes.
► True (Page 101)
► False
Question No: 22  (Marks: 1) - Please choose one
In _______ algorithm, you hope that by choosing a local optimum at each step, you will end up at a global optimum.

► Simple
► Non Greedy
► Greedy  (Page 97)
► Brute force

Question No: 23  (Marks: 1) - Please choose one
Huffman algorithm uses a greedy approach to generate an prefix code T that minimizes the expected length $B(T)$ of the encoded string.

► True  (Page 102)
► False
Question # 1 of 10 (Marks: 1) Please choose one
Counting Money problem is an example which cannot be optimally solved by greedy algorithm.

► True (Page 97)
► False

Question # 1 of 10 (Marks: 1) Please choose one
Huffman algorithm generates an optimum prefix code.

► True (Page 102)
► False

Question # 1 of 10 (Marks: 1) Please choose one
If the string “lmncde” is coded with ASCII code, the message length would be _______ bits.

► 24
► 36
► 48 (6*8=48)
► 60

Question # 1 of 10 (Marks: 1) Please choose one
There are _______ nested loops in DP based algorithm for computing the minimum cost of chain matrix multiplication.

► 2
► 3 (Page 90)
► 4
► 5

Question # 1 of 10 (Marks: 1) Please choose one
Inductive approach to compute entries of V is implied in ______ based solution of knapsack problem.

► Brute force
► Dynamic programming (Page 93)
Question # 1 of 10 (Marks: 1) Please choose one
A number of lectures are to be given in a single lecture hall. Optimum scheduling for this is an example of Activity selection.

► True  (Page 105)
► False

Question # 1 of 10 (Marks: 1) Please choose one
The activity scheduling is a simple scheduling problem for which the greedy algorithm approach provides a/an _______ solution.

► Simple
► Sub optimal
► Optimal  (Page 105)
► Non optimal

Question # 1 of 10 (Marks: 1) Please choose one
The string [xyz], if coded with ASCII code, the message length would be 24 bits.

► True  (3*8=24)
► False

Question # 1 of 10 (Marks: 1) Please choose one
An application problem is one in which you want to find, not just a solution, but the ____ solution.

► Simple
► Good  (Page 113) not sure
► Best
► Worst
Quiz No.3 (January 28, 2013)

Question # 1 of 10 (Marks: 1) Please choose one
A dense undirected graph is:

► A graph in which $E = O(V^2)$ [click here for detail]
► A graph in which $E = O(V)$
► A graph in which $E = O(\log V)$
► All items above may be used to characterize a dense undirected graph

Question # 1 of 10 (Marks: 1) Please choose one
Suppose that a graph $G = (V,E)$ is implemented using adjacency lists. What is the complexity of a breadth-first traversal of $G$?

► $O(|V|^2)$
► $O(|V| |E|)$
► $O(|V|^2|E|)$
► $O(|V| + |E|)$ [pg 116]

Question # 1 of 10 (Marks: 1) Please choose one
Which is true statement?

► Breadth first search is shortest path algorithm that works on un-weighted graphs (Page 153)
► Depth first search is shortest path algorithm that works on un-weighted graphs.
► Both of above are true.
► None of above are true.

Question # 1 of 10 (Marks: 1) Please choose one
Forward edge is:

► $(u, v)$ where $u$ is a proper descendent of $v$ in the tree.
► $(u, v)$ where $v$ is a proper descendent of $u$ in the tree. (Page 129)
► $(u, v)$ where $v$ is a proper ancestor of $u$ in the tree.
► $(u, v)$ where $u$ is a proper ancestor of $v$ in the tree.
**Question # 1 of 10  ( Marks: 1 )  Please choose one**

What general property of the list indicates that the graph has an isolated vertex?

► There is Null pointer at the end of list.
► The Isolated vertex is not handled in list.
► Only one value is entered in the list.
► There is at least one null list.

**Question # 1 of 10  ( Marks: 1 )  Please choose one**

If you find yourself in maze the better traversal approach will be:

► BFS  [Click here for detail]
► BFS and DFS both are valid
► Level order
► DFS

**Question # 1 of 10  ( Marks: 1 )  Please choose one**

In digraph G=(V,E); G has cycle if and only if:

► The DFS forest has forward edge.
► The DFS forest has back edge  [Page 131]
► The DFS forest has both back and forward edge
► BFS forest has forward edge

**Question # 1 of 10  ( Marks: 1 )  Please choose one**

Back edge is:

► (u, v) where v is an ancestor of u in the tree.  [Page 128]
► (u, v) where u is an ancestor of v in the tree.
► (u, v) where v is an predecessor of u in the tree.
► None of above

**Question # 1 of 10  ( Marks: 1 )  Please choose one**

Which statement is true?

► If a dynamic-programming problem satisfies the optimal-substructure property, then a locally optimal solution is globally optimal.
► If a greedy choice property satisfies the optimal-substructure property, then a locally optimal solution is globally optimal.
► Both of above
► None of above
Question # 1 of 10 (Marks: 1) Please choose one

Cross edge is:

► (u, v) where u and v are not ancestor of one another
► (u, v) where u is ancestor of v and v is not descendent of u.
► (u, v) where u and v are not ancestor or descendent of one another
► (u, v) where u and v are either ancestor or descendent of one another.

Quiz No.4 (February 5, 2013)

Question # 1 of 10 (Marks: 1) Please choose one
Kruskal's algorithm (choose best non-cycle edge) is better than Prim's (choose best tree edge) when the graph has relatively few edges.

► True click here 4 detail
► False

Question # 1 of 10 (Marks: 1) Please choose one
Which is true statement in the following?

► Kruskal algorithm is multiple source technique for finding MST. click here for detail
► Kruskal’s algorithm is used to find minimum spanning tree of a graph, time complexity of this algorithm is O(EV)
► Both of above
► Kruskal’s algorithm (choose best non-cycle edge) is better than Prim’s (choose best Tree edge) when the graph has relatively few edges. click here 4 detail

Question # 1 of 10 (Marks: 1) Please choose one
What algorithm technique is used in the implementation of Kruskal solution for the MST?

► Greedy Technique (Page 142)
► Divide-and-Conquer Technique
► Dynamic Programming Technique
► The algorithm combines more than one of the above techniques

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Question # 1 of 10 (Marks: 1) Please choose one
What is the time complexity to extract a vertex from the priority queue in Prim’s algorithm?

► O (log E)
► (V)
► (V+E)
► O (log V)  (Page 152)

Question # 1 of 10 (Marks: 1) Please choose one
The relationship between number of back edges and number of cycles in DFS is,

► Both are equal
► Back edges are half of cycles
► Back edges are one quarter of cycles
► There is no relationship between no. of edges and cycles  (Page 131)

Question # 1 of 10 (Marks: 1) Please choose one
You have an adjacency list for G, what is the time complexity to compute Graph transpose G^T.?

► (V + E)  (Page 138)
► (V E)
► (V)
► (V^2)

Question # 1 of 10 (Marks: 1) Please choose one
There is relationship between number of back edges and number of cycles in DFS

► Both are equal.
► Cycles are half of back edges.
► Cycles are one fourth of back edges.
► There is no relationship between back edges and number of cycles.  (Page 131)

Question # 1 of 10 (Marks: 1) Please choose one
A digraph is strongly connected under what condition?

► A digraph is strongly connected if for every pair of vertices u, v e V, u can reach v.
► A digraph is strongly connected if for every pair of vertices u, v e V, u can reach v and vice versa.  (Page 135)
► A digraph is strongly connected if for at least one pair of vertex u, v e V, u can reach v and vice versa.
► A digraph is strongly connected if at least one third pair of vertices u, v e V, u can reach v and vice versa.
Question # 1 of 10 (Marks: 1) Please choose one
In in-place sorting algorithm is one that uses arrays for storage:

► An additional array
► No additional array (Page 54)
► Both of above may be true according to algorithm
► More than 3 arrays of one dimension.

Question # 1 of 10 (Marks: 1) Please choose one
In stable sorting algorithm

► One array is used
► In which duplicating elements are not handled.
► More then one arrays are required.
► Duplicating elements remain in same relative position after sorting. (Page 54)

Question # 1 of 10 (Marks: 1) Please choose one
Which sorting algorithm is faster:

► O(n^2)
► O(nlogn) (Page 46)
► O(n+k)
► O(n^3)

Question # 1 of 10 (Marks: 1) Please choose one
In Quick sort algorithm, constants hidden in T(n lg n) are

► Large
► Medium
► Not known
► Small  Click here for detail
Question # 1 of 10 (Marks: 1) Please choose one
Quick sort is based on divide and conquer paradigm; we divide the problem on base of pivot element and:

► There is explicit combine process as well to conquer the solution.
► No work is needed to combine the sub-arrays, the array is already sorted
► Merging the sub arrays
► None of above. (Page 51)
Ref: - random choices for the pivot element and each choice have an equal probability of 1/n of occurring. So we can modify the above recurrence to compute an average rather than a max

Question # 1 of 10 (Marks: 1) Please choose one
Dijkstra’s algorithm:

► Has greedy approach to find all shortest paths
► Has both greedy and Dynamic approach to find all shortest paths
► Has greedy approach to compute single source shortest paths to all other vertices (Page 154)
► Has both greedy and dynamic approach to compute single source shortest paths to all other vertices.

Question # 1 of 10 (Marks: 1) Please choose one
Which may be stable sort:

► Bubble sort
► Insertion sort
► Both of above (page 54)
► Selection sort

Question # 1 of 10 (Marks: 1) Please choose one
In the analysis of Selection algorithm, we eliminate a constant fraction of the array with each phase; we get the convergent ____________ series in the analysis,

► linear
► arithmetic
► geometric (page 37)
► exponent

Question # 1 of 10 (Marks: 1) Please choose one
How much time merge sort takes for an array of numbers?

► T(n^2)
► T(n) (Page 40)
► T(log n)
► T(n log n)
Question # 1 of 10 (Marks: 1) Please choose one
Counting sort has time complexity:

► O(n)  [Click here for detail]
► O(n+k)
► O(k)
► O(nlogn)

Question # 1 of 10 (Marks: 1) Please choose one
The analysis of Selection algorithm shows the total running time is indeed ________ in n,

► arithmetic
► geometric
► linear  (Page 37)
► orthogonal

Question # 1 of 10 (Marks: 1) Please choose one
Sorting is one of the few problems where provable ________ bonds exits on how fast we can sort,

► upper
► lower  (Page 39)
► average
► log n

Question # 1 of 10 (Marks: 1) Please choose one
In the analysis of Selection algorithm, we make a number of passes, in fact it could be as many as,

► T(n)
► T(n / 2)
► log n  (Page 37)
► n / 2 + n / 4

Question # 1 of 10 (Marks: 1) Please choose one
The number of nodes in a complete binary tree of height h is

► 2^(h+1) – 1  (Page 40)
► 2 * (h+1) – 1
► 2 * (h+1)
► ((h+1)^2) – 1
Question # 1 of 10 (Marks: 1) Please choose one
How many elements do we eliminate in each time for the Analysis of Selection algorithm?

► n / 2 elements (Page 37)
► (n / 2) + n elements
► n / 4 elements
► 2 n elements

Question # 1 of 10 (Marks: 1) Please choose one
Slow sorting algorithms run in,

► T(n^2) (Page 39)
► T(n)
► T( log n)
► T(n log n)

Question # 1 of 10 (Marks: 1) Please choose one
Counting sort is suitable to sort the elements in range 1 to k:

► K is large
► K is small (Page 57)
► K may be large or small
► None

Question # 1 of 10 (Marks: 1) Please choose one
Heaps can be stored in arrays without using any pointers; this is due to the __________ nature of the binary tree,

► left-complete (Page 40)
► right-complete
► tree nodes
► tree leaves

Question # 1 of 10 (Marks: 1) Please choose one
Sieve Technique can be applied to selection problem?

► True (Page 35)
► False

Question # 1 of 10 (Marks: 1) Please choose one
A heap is a left-complete binary tree that conforms to the __________

► increasing order only
► decreasing order only
► heap order (Page 40)
► (log n) order
Question # 1 of 10 (Marks: 1) Please choose one
Divide-and-conquer as breaking the problem into a small number of
► pivot
► Sieve
► smaller sub problems (Page 34)
► Selection

Question # 1 of 10 (Marks: 1) Please choose one
In Sieve Technique we do not know which item is of interest
► True (Page 34)
► False

Question # 1 of 10 (Marks: 1) Please choose one
The recurrence relation of Tower of Hanoi is given below T(n)={1 if n=1 and 2T(n-1) if n >1 In order to move a tower of 5 rings from one peg to another, how many ring moves are required?

► 16
► 10
► 32
► 31 Click here for detail

Question # 1 of 10 (Marks: 1) Please choose one
For the heap sort, access to nodes involves simple ______________ operations.
► arithmetic (Page 41)
► binary
► algebraic
► logarithmic

Question # 1 of 10 (Marks: 1) Please choose one
For the sieve technique we solve the problem,
► recursively (Page 34)
► mathematically
► precisely
► accurately

Question # 1 of 10 (Marks: 1) Please choose one
The sieve technique works in __________ as follows
► phases (Page 34)
► numbers
► integers
► routines
Question # 1 of 10 (Marks: 1) Please choose one
A (an) _________ is a left-complete binary tree that conforms to the heap order
► heap (Page 40)
► binary tree
► binary search tree
► array

Question # 1 of 10 (Marks: 1) Please choose one
The sieve technique is a special case, where the number of sub problems is just
► 5
► many
► 1 (Page 34)
► few

Question # 1 of 10 (Marks: 1) Please choose one
Analysis of Selection algorithm ends up with,
► T(n)
► T(1 / 1 + n)
► T(n / 2)
► T((n / 2) + n) (Page 37)

Question # 1 of 10 (Marks: 1) Please choose one
For the heap sort we store the tree nodes in
► level-order traversal (Page 40)
► in-order traversal
► pre-order traversal
► post-order traversal

Question # 1 of 10 (Marks: 1) Please choose one
The reason for introducing Sieve Technique algorithm is that it illustrates a very important special case of,
► divide-and-conquer (Page 34)
► decrease and conquer
► greedy nature
► 2-dimension Maxima

Question # 1 of 10 (Marks: 1) Please choose one
Theta asymptotic notation for T (n) :
► Set of functions described by: c1g(n)Set of functions described by c1g(n)> =f(n) for c1 s
► Theta for T(n)is actually upper and worst case comp
► Set of functions described by:
► c1g(n)
Question # 1 of 10 (Marks: 1) Please choose one

Sieve Technique applies to problems where we are interested in finding a single item from a larger set of

► $n$ items (Page 34)
► phases
► pointers
► constant

Question # 1 of 10 (Marks: 1) Please choose one
Memorization is?

► To store previous results for future use
► To avoid this unnecessary repetitions by writing down the results of recursive calls and looking them up again if we need them later (Page 47)
► To make the process accurate
► None of the above

Question # 1 of 10 (Marks: 1) Please choose one
Quick sort is

► Stable & in place
► Not stable but in place (Page 57)
► Stable but not in place
► Some time stable & some times in place

Question # 1 of 10 (Marks: 1) Please choose one
One example of in place but not stable algorithm is

► Merger Sort
► Quick Sort (Page 54)
► Continuation Sort
► Bubble Sort

Question # 1 of 10 (Marks: 1) Please choose one
Continuation sort is suitable to sort the elements in range 1 to $k$

► $K$ is Large
► $K$ is not known
► $K$ may be small or large
► $K$ is small (Page 57)
Question # 1 of 10 (Marks: 1) Please choose one
Which may be a stable sort?
► Merger
► Insertion
► Both above (Page 54)
► None of the above

Question # 1 of 10 (Marks: 1) Please choose one
An in place sorting algorithm is one that uses ___ arrays for storage
► Two dimensional arrays
► More than one array
► No Additional Array (Page 54)
► None of the above

Question # 1 of 10 (Marks: 1) Please choose one
Continuing sort has time complexity of?
► O(n)  Click here for detail
► O(n+k)
► O(nlogn)
► O(k)

Question # 1 of 10 (Marks: 1) Please choose one
single item from a larger set of ____________
► n items (Page 34)
► phases
► pointers
► vconstant

Question # 1 of 10 (Marks: 1) Please choose one
For the Sieve Technique we take time
► T(nk) (Page 34)
► T(n / 3)
► n^2
► n/3
Question # 1 of 10 (Marks: 1) Please choose one
One Example of in place but not stable sort is

► Quick (Page 54)
► Heap
► Merge
► Bubble

Question # 1 of 10 (Marks: 1) Please choose one
Consider the following Algorithm:
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
Some More MCQs

Question No: 1  ( Marks: 1 )  - Please choose one
Due to left complete nature of binary tree, the heap can be stored in

► Arrays (Page 40)
► Structures
► Link Lists
► Stack

Question No: 2  ( Marks: 1 )  - Please choose one
What type of instructions Random Access Machine (RAM) can execute?

► Algebraic and logic
► Geometric and arithmetic
► Arithmetic and logic (Page 10)
► Parallel and recursive

Question No: 3  ( Marks: 1 )  - Please choose one
What is the total time to heapify?

► $O(\log n)$ (Page 43)
► $O(n \log n)$
► $O(n^2 \log n)$
► $O(\log^2 n)$

Question No: 4  ( Marks: 1 )  - Please choose one
word Algorithm comes from the name of the muslim author ____________

► Abu Ja'far Mohammad ibn Musa al-Khowarizmi.

Question No: 5  ( Marks: 1 )  - Please choose one
al-Khwarizmi’s work was written in a book titled ______________

► al-Kitab al-mukhatasar fi hisab al-jabr wa’l-muqabalah
Question No: 6  (Marks: 1)  - Please choose one
Random access machine or RAM is a/an

► Machine build by Al-Khwarizmi
► Mechanical machine
► Electronics machine
► Mathematical model (Page 10)

Question No: 7  (Marks: 1)  - Please choose one
A RAM is an idealized machine with _____________ random-access memory.

► 256MB
► 512MB
► an infinitely large (Page 10)
► 100GB

Question No: 8  (Marks: 1)  - Please choose one
What will be the total number of max comparisons if we run brute-force maxima algorithm with n elements?

► \(2^n\)
► \(n^2\)
► \(n^3\)
► \(n\)
► \(n^8\)

Question No: 9  (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: 10  (Marks: 1)  - Please choose one
Is it possible to sort without making comparisons?

► Yes  (Page 57)
► No
Question No: 11 (Marks: 1) - Please choose one
When we call heapify then at each level the comparison performed takes time

► It will take $\Theta (1)$  (Page 43)
► Time will vary according to the nature of input data
► It can not be predicted
► It will take $\Theta (\log n)$

Question No: 12 (Marks: 1) - Please choose one
In Quick sort, we don’t have the control over the sizes of recursive calls

► True  (Page 40)
► False
► Less information to decide
► Either true or false

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

► $\Theta (1)$
► $\Theta (n^2)$  Click here for detail
► $\Theta (n)$
► $\Theta (n \log n)$

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 $k$  (Page 86)
► 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  (Page 91)
► 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 (correct)**
► None of these

Question No: 17  (Marks: 1) - Please choose one
who invented the quick sort

► **C.A.R. Hoare**  [Click here for detail](#)

Question No: 18  (Marks: 1) - Please choose one
main elements to a divide-and-conquer

► **Divide, conquer, combine (Page 27)**

Question No: 19  (Marks: 1) - Please choose one
Mergesort is a stable algorithm but not an in-place algorithm.

► **True (Page 54)**
► False

Question No: 20  (Marks: 1) - Please choose one
Counting sort the numbers to be sorted are in the range 1 to \( k \) where \( k \) is small.

► **True  (Page 57)**
► False

Question No: 21  (Marks: 1) - Please choose one
In selection algorithm, because we eliminate a constant fraction of the array with each phase, we get the

► **Convergent geometric series (Page 37)**
► Divergent geometric series
► None of these
Question No: 22 (Marks: 1) - Please choose one
If an algorithm has a complexity of $\log_2 n + n \log_2 n + n$, we could say that it has complexity

► O(n)
► O(n log_2 n)
► O(3)
► O( log_2 ( log_2 n ))
► O ( log_2 n)

Question No: 23 (Marks: 1) - Please choose one
In RAM model instructions are executed

► One after another (Page 10)
► Parallel
► Concurrent
► Random

Question No: 24 (Marks: 1) - Please choose one
Due to left-complete nature of binary tree, heaps can be stored in

► Link list
► Structure
► Array (Page 40)
► None of above

Question No: 25 (Marks: 1) - Please choose one
The time assumed for each basic operation to execute on RAM model of computation is -----

► Infinite
► Continuous
► Constant (Page 10)
► Variable

Question No: 26 (Marks: 1) - Please choose one
If the indices passed to merge sort algorithm are not equal, the algorithm may return immediately.

► True
► False (Page 28)

Question No: 27 (Marks: 1) - Please choose one
Brute-force algorithm uses no intelligence in pruning out decisions.

► True (Page 18)
► False
Question No: 28 (Marks: 1) - Please choose one
In analysis, the Upper Bound means the function grows asymptotically no faster than its largest term.

► True (Page 24)
► False

Question No: 29 (Marks: 1) - Please choose one
For small values of n, any algorithm is fast enough. Running time does become an issue when n gets large.

► True (Page 14)
► Fast

Question No: 30 (Marks: 1) - Please choose one
The array to be sorted is not passed as argument to the merge sort algorithm.

► True
► False

Question No: 31 (Marks: 1) - Please choose one
In simple brute-force algorithm, we give no thought to efficiency.

► True (Page 11)
► False

Question No: 32 (Marks: 1) - Please choose one
The ancient Roman politicians understood an important principle of good algorithm design that is plan-sweep algorithm.

► True
► False (Page 27) [Divide and Conquer]

Question No: 33 (Marks: 1) - Please choose one
In 2d-space a point is said to be ________ if it is not dominated by any other point in that space.

► Member
► Minimal
► Maximal (Page 11)
► Joint

Question No: 34 (Marks: 1) - Please choose one
An algorithm is a mathematical entity that is dependent on a specific programming language.

► True
► False (Page 7)
Question No: 35 (Marks: 1) - Please choose one
The running time of an algorithm would not depend upon the optimization by the compiler but that of an implementation of the algorithm would depend on it.

- True (Page 13)
- False

Question No: 36 (Marks: 1) - Please choose one
F(n) and g(n) are asymptotically equivalent. This means that they have essentially the same _________ for large n.

- Results
- Variables
- Size
- Growth rates (Page 23)

Question No: 37 (Marks: 1) - Please choose one
8n^2 + 2n - 3 will eventually exceed c2*(n) no matter how large we make c2.

- True (Page 25)
- False

Question No: 38 (Marks: 1) - Please choose one
If we associate (x, y) integers pair to cars where x is the speed of the car and y is the negation of the price. High y value for a car means a ________ car.

- Fast
- Slow
- Expensive
- Cheap (Page 11)

Question No: 39 (Marks: 1) - Please choose one
The function f(n) = n(logn+1)/2 is asymptotically equivalent to n log n. Here Upper Bound means the function f(n) grows asymptotically __________ faster than n log n.

- More
- Quiet
- Not (Page 24)
- At least
Question No: 40 (Marks: 1) - Please choose one
After sorting in merge sort algorithm, merging process is invoked.

▶ True (Page 28)
▶ False

Question No: 41 (Marks: 1) - Please choose one
Asymptotic growth rate of the function is taken over________ case running time.

▶ Best
▶ Average
▶ Worst (Page 14)
▶ Normal

Question No: 42 (Marks: 1) - Please choose one
In analysis of \( f(n) = n \cdot (n/5) + n - 10 \log n \), \( f(n) \) is asymptotically equivalent to ________.

▶ \( n \)
▶ \( 2n \)
▶ \( n + 1 \)
▶ \( n^2 \) (Page 23)

Question No: 43 (Marks: 1) - Please choose one
Algorithm is concerned with.......issues.

▶ Macro
▶ Micro
▶ Both Macro & Micro (Page 8)
▶ Normal

Question No: 44 (Marks: 1) - Please choose one
We cannot make any significant improvement in the running time which is better than that of brute-force algorithm.

▶ True
▶ False (Page 18)

Question No: 45 (Marks: 1) - Please choose one
In addition to passing in the array itself to Merge Sort algorithm, we will pass in ________other arguments which are indices.

▶ Two (Page 28)
▶ Three
▶ Four
▶ Five
Question No: 46 (Marks: 1) - Please choose one
In analysis, the Lower Bound means the function grows asymptotically at least as fast as its largest term.

► True (Page 24)
► False

Question No: 47 (Marks: 1) - Please choose one
Efficient algorithm requires less computational……..

► Memory
► Running Time
► Memory and Running Time (Page 9)
► Energy

Question No: 48 (Marks: 1) - Please choose one
The O-notation is used to state only the asymptotic _______ bounds.

► Two
► Lower
► Upper (Page 25)
► Both lower & upper

Question No: 49 (Marks: 1) - Please choose one
For the worst-case running time analysis, the nested loop structure containing one “for” and one “while” loop, might be expressed as a pair of _______ nested summations.

► 1
► 2 (Page 16)
► 3
► 4

Question No: 50 (Marks: 1) - Please choose one
Before sweeping a vertical line in plane sweep approach, in start sorting of the points is done in increasing order of their _______ coordinates.

► X (Page 18)
► Y
► Z
► X & Y
Question No: 51  (Marks: 1) - Please choose one
Brute-force algorithm for 2D-Maxima is operated by comparing ________ pairs of points.

► Two
► Some
► Most
► All (Page 18)

Question No: 52  (Marks: 1) - Please choose one
The function \( f(n) = n(\log n + 1)/2 \) is asymptotically equivalent to \( n \log n \). Here Lower Bound means function \( f(n) \) grows asymptotically at __________ as fast as \( n \log n \).

► Normal
► Least (Page 23)
► Most
► All

Question No: 53  (Marks: 1) - Please choose one
In plane sweep approach, a vertical line is swept across the 2d-plane and _______ structure is used for holding the maximal points lying to the left of the sweep line.

► Array
► Queue
► Stack (Page 18)
► Tree

Question No: 54  (Marks: 1) - Please choose one
Algorithm analysts know for sure about efficient solutions for NP-complete problems.

► True
► False (Page 9)

Question No: 55 (Marks: 1) - Please choose one
The analysis of Selection algorithm shows the total running time is indeed ________ in \( n \).

► arithmetic
► geometric
► linear (Page 37)
► orthogonal
Question No: 56 (Marks: 1) - Please choose one
The sieve technique works where we have to find ________ item(s) from a large input.

► Single (Page 34)
► Two
► Three
► Similar

Question No: 57 (Marks: 1) - Please choose one
In which order we can sort?

► increasing order only
► decreasing order only
► increasing order or decreasing order (Page 39)
► both at the same time

Question No: 58 (Marks: 1) - Please choose one
For the heap sort we store the tree nodes in

► level-order traversal (Page 40)
► in-order traversal
► pre-order traversal
► post-order traversal

Question No: 59 (Marks: 1) - Please choose one
In the analysis of Selection algorithm, we eliminate a constant fraction of the array with each phase; we get the convergent ____________ series in the analysis,

► linear
► arithmetic
► geometric (Page 37)
► exponent

Question No: 60 (Marks: 1) - Please choose one
How much time merge sort takes for an array of numbers?

► T(n^2)
► T(n)
► T( log n)
► T(n log n) (Page 40)
Question No: 61 (Marks: 1) - Please choose one
Memoization is?

► To store previous results for future use
► To avoid this unnecessary repetitions by writing down the results of recursive calls and looking them up again if we need them later (page 74)
► To make the process accurate
► None of the above

Question No: 62 (Marks: 1) - Please choose one
Cont sort is suitable to sort the elements in range 1 to k

► K is Large
► K is not known
► K may be small or large
► K is small (Page 57)

Question No: 63 (Marks: 1) - Please choose one
In place stable sorting algorithm.

► If duplicate elements remain in the same relative position after sorting (Page 54)
► One array is used
► More than one arrays are required
► Duplicating elements not handled

Question No: 64 (Marks: 1) - Please choose one
Sorting is one of the few problems where provable ________ bonds exits on how fast we can sort,

► upper
► lower (Page 39)
► average
► log n

Question No: 65 (Marks: 1) - Please choose one
Counting sort has time complexity:

► O(n) (Page 58)
► O(n+k)
► O(k)
► O(nlogn)
Question No: 66 (Marks: 1) - Please choose one
The running time of quick sort depends heavily on the selection of

► No of inputs
► Arrangement of elements in array
► Size o elements
► Pivot elements (Page 49)

Question No: 67 (Marks: 1) - Please choose one
Which may be stable sort:

► Bubble sort
► Insertion sort
► Both of above (Page 54)

Question No: 68 (Marks: 1) - Please choose one
In Quick Sort Constants hidden in T(n log n) are

► Large
► Medium
► Small Click here for detail
► Not Known

Question No: 69 (Marks: 1) - Please choose one
Quick sort is based on divide and conquer paradigm; we divide the problem on base of pivot element and:

► There is explicit combine process as well to conquer the solution.
► No work is needed to combine the sub-arrays, the array is already sorted
► Merging the sub arrays
► None of above. (Page 51)

Ref: - random choices for the pivot element and each choice have an equal probability of 1/n of occurring. So we can modify the above recurrence to compute an average rather than a max

Question No: 70 (Marks: 1) - Please choose one
A point p in 2-dimensional space is usually given by its integer coordinate(s)____________

► p.x only
► p.y only
► p.x & p.z
► p.x & p.y (Page 10)
Question No: 71 (Marks: 1) - Please choose one
In __________ we have to find rank of an element from given input.
► Merge sort algorithm
► Selection problem  (Page 34)
► Brute force technique
► Plane Sweep algorithm

Question No: 72 (Marks: 1) - Please choose one
In Heap Sort algorithm, if heap property is violated __________
► We call Build heap procedure
► We call Heapify procedure
► We ignore
► Heap property can never be violated

Question No: 73 (Marks: 1) - Please choose one
Upper bound requires that there exist positive constants c2 and n0 such that f(n) ____ c2n for all n <= n0(ye question ghalat lag raha hai mujhae
► Less than
► Equal to or Less than  (Page 25)
► Equal or Greater than
► Greater than

Question No: 74 (Marks: 1) - Please choose one
A RAM is an idealized algorithm with takes an infinitely large random-access memory.
► True
► False  (Page 10)

Question No: 75 (Marks: 1) - Please choose one
_________ is one of the few problems, where provable lower bounds exist on how fast we can sort.
► Searching
► Sorting  (Page )
► Both Searching & Sorting
► Graphing

Question No: 76 (Marks: 1) - Please choose one
Floor and ceiling are __________ to calculate while analyzing algorithms.
► Very easy
► Usually considered difficult  (Page 31)
Question No: 77 (Marks: 1) - Please choose one
In Heap Sort algorithm, the maximum levels an element can move upward is ________

► Theta (log n) (Page 43)
► Order (log n)
► Omega (log n)
► O (1) i.e. Constant time

Question No: 78 (Marks: 1) - Please choose one
A point p in 2-dimensional space is usually given by its integer coordinate(s)________

► p.x only p.y
► only p.x & p.z
► p.x & p.y (Page 17)

Question No: 79 (Marks: 1) - Please choose one
In Heap Sort algorithm, the total running time for Heapify procedure is __________

► Theta (log n) (Page 43)
► Order (log n)
► Omega (log n)
► O (1) i.e. Constant time

Question No: 80 (Marks: 1) - Please choose one
Algorithm is a mathematical entity, which is independent of a specific machine and operating system.

► True
► False (Page 7)

Question No: 81 (Marks: 1) - Please choose one
While Sorting, the ordered domain means for any two input elements x and y ________ satisfies only.

► x < y
► x > y
► x = y
► All of the above (Page 39)

Question No: 82 (Marks: 1) - Please choose one
Quick sort is best from the perspective of Locality of reference.

► True (Page 9)
► False
Question No: 83 (Marks: 1) - Please choose one
In Heap Sort algorithm, we build ______ for ascending sort.

► Max heap (Page 41)
► Min heap

Question No: 84 (Marks: 1) - Please choose one
In Sieve Technique, we know the item of interest.

► True
► False (Page 34)

Question No: 85 (Marks: 1) - Please choose one
While solving Selection problem, in Sieve technique we partition input data __________

► In increasing order
► In decreasing order
► According to Pivot (Page 35)
► Randomly

Question No: 86 (Marks: 1) - Please choose one
In pseudo code, the level of details depends on intended audience of the algorithm.

► True (Page 12)
► False

Question No: 87 (Marks: 1) - Please choose one
If the indices passed to merge sort algorithm are ________, then this means that there is only one element to sort.

► Small
► Large
► Equal (Page 28)
► Not Equal