QUESTION BANK: (JNTUH)

S. No	Question	Blooms Taxonomy Level	Course Outcomes
	UNIT – I		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**Define** the term algorithm and state the criteria the algorithm should satisfy.	Knowledge	1
2	**Compute** the average case time complexity of quick sort	Apply	1
3	**Describe** the role of space complexity and time complexity of a program?	Knowledge	1
4	If $f(n)=5n^2+6n+4$, then **prove** that f(n) is $O(n^2)$	Apply	4
5	**What** is meant by divide and conquer? Give the recurrence relation for divide and conquer.	Understand	1
	PART – B (LONGANSWER QUESTIONS)		
1	**Write** binary search algorithm and analyze its time complexity	Understand	1
2	**Explain** quick sort algorithm and simulate it for the following data 20, 5,10,16 ,54 ,21	Apply	1
3	**Illustrate** merge sort algorithm and discuss time complexity	Understand	2
4	**Describe** strassen's matrix multiplication.	Understand	2
5	**Sort** the list of numbers using merge sort: 78, 32, 42, 62, 98, 12, 34, 83	Apply	1

S. No	Question	Blooms Taxonomy Level	Course Outcomes
	UNIT – II		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**Discuss about** union operation on sets	Knowledge	2
2	**Describe** AND/OR graph	Understand	2
3	**Explain** game tree	Understand	3
4	**Define** a connected and bi-connected component.	Knowledge	2
5	**Define** an articulation point?	Knowledge	2
	PART – B (LONGANSWER QUESTIONS)		
1	**Discuss** N-queens problem and algorithm	Understand	2
2	**Discuss about** weighting rule for finding UNION of sets and collapsing rule	Understand	2
3	**Differentiate** divide and conquer and greedy method	Understand	2
4	**Discuss** Graph coloring problem	Understand	2
5	**Compare** and contrast BFS and DFS.	nalyze	2

S. No	Question	Blooms Taxonomy Level	Course Outcomes
	UNIT – III		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**Define** greedy method	Know edge	3
2	**State** Prim's algorithm	Knowledge	3
3	**What** is job sequencing with deadlines problem	Know edge	3
4	**State** the principle of optimality	Know edge	3
5	**Define** minimum cost spanning tree	Know edge	3
	PART – B (LONGANSWER QUESTIONS)		
1	**Discuss** single source shortest path problem with example	Apply	3
2	**Discuss** kruskal's algorithm with an example	Understand	3
3	**Write** an algorithm knapsack problem .Give example	Apply	3
4	**Explain** prims algorithm with an example	Understand	3
5	**Compute** the optimal solution for knapsack problem using greedy method N=3, M= 20, (p1,p2,p3)= (25,24,15), (w1,w2,w3) =(18,15,10)	Apply	3

S.No	Question	Blooms Taxonomy Level	Course Outcomes
	UNIT – IV		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**Write** an algorithm for optimal binary search tree Give example	Apply	4
2	**Explain** 0/1 knapsack problem with example	Understand	4
3	**Discuss** all pairs shortest path problem with an example	Understand	4
4	**Explain** 8 – Queens problem	Understand	4
5	**Define** Sum of Subsets problem	Understand	4
	PART – B (LONGANSWER QUESTIONS)		
1	**Describe** the travelling salesman problem and discuss how to solve it using dynamic programming?	Understand	4
2	**Explain** the concept Chained matrix multiplication.	Apply	4
3	**Solve** the solution for 0/1 knapsack problem using dynamic programming(p1,p2,p3, p4) = (11, 21, 31, 33), (w1, w2, w3, w4) = (2, 11, 22, 15), M=40, n=4	Apply	4
4	**Use** optimal binary search tree algorithm and compute wij, cij, rij, 0<=i<=j<=4,p1=1/10, p2=1/5, p3=1/10, p4=1/120, q0=1/5, q1=1/10, q2=1/5, q3=1/20,q4=1/20.	Apply	3

5	**Discuss** all pairs shortest path problem with an example	Understand	4

S.No	Question	Blooms Taxonomy Level	Course Outcomes
	UNIT – V		
	PART – A (SHORT ANSWER QUESTIONS)		
1	**Define** a dead node	Knowledge	5
2	**Differentiate** live node and dead node	Knowledge	5
3	**Compare** NP-hard and NP-completeness	Knowledge	5
4	**Define** deterministic problem	Understand	5
5	**Define** maxclique problem?	Understand	5
	PART – B (LONG ANSWER QUESTIONS)		
1	**Explain** the principle of FIFO branch and bound	Apply	5
2	**Explain** the method of reduction to solve travelling sales person problem using branch and bound	Apply	5
3	**Write** non deterministic algorithm for sorting and searching	Understand	5
4	**What is** chromatic number decision problem and clique decision problem	Apply	5
5	**Explain** Cook's theorem	Apply	5

X. OBJECTIVE QUESTIONS

MULTIPLE CHOICE QUESTIONS

UNIT-I

1. In analysis of algorithm, approximate relationship between the size of the job and the amount of work required to do is expressed by using _____

(a) Central tendency (b) Differential equation (c) Order of execution (d) Order of magnitude (e) Order of Storage.

Ans :Order of execution

2. Worst case efficiency of binary search is

(a) log2 n + 1 (b) n (c) N2 (d) 2n (e) log n.

Ans : log2 n + 1

3. For analyzing an algorithm, which is better computing time?

(a)O (100 Log N) (b) O (N) (c)O (2N) (d) O (N logN) (e) O (N2).

Ans :O (100 Log N)

4. Consider the usual algorithm for determining whether a sequence of parentheses is balanced. What is the maximum number of parentheses that will appear on the stack AT ANY ONE TIME when the algorithm analyzes: (()(())(()))

(a) 1 (b)2 (c)3 (d) 4

Ans :3

5. Breadth first search _____

(a) Scans each incident node along with its children. (b) Scans all incident edges before moving to other node.(c) Issame as backtracking (d) Scans all the nodes in random order.

Ans :Scans all incident edges before moving to other node.

6. Which method of traversal does not use stack to hold nodes that are waiting to be processed?

(a) Dept First (b) D-search (c)Breadth first (d) Back-tracking

Ans :Breadth first

7. The Knapsack problem where the objective function is to minimize the profit is_____
(a) Greedy (b) Dynamic 0 / 1 (c) Back tracking (d) Branch & Bound 0/1

Ans :Branch& Bound 0/1

8. Choose the correct answer for the following statements:

I. The theory of NP–completeness provides a method of obtaining a polynomial time for NPalgorithms.

II. All NP-complete problem are NP-Hard.

(a) I is FALSE and II is TRUE (b) I is TRUE and II is FALSE (c) Both are TRUE (d) Both are FALSE

Ans :I is FALSE and II is TRUE

9. If all c(i, j)'s and r(i, j)'s are calculated, then OBST algorithm in worst case takes one of the following time.
(a) O(n log n) (b) O(n3) (c) O(n2) (d) O(log n) (e) O(n4).

Ans : O(n3)

10. The upper bound on the time complexity of the nondeterministic sorting algorithm is
(a) O(n) (b) O(n log n) (c) O(1) (d) O(log n) (e) O(n2).

Ans: O(n)

UNIT-II

1. Name the node which has been generated but none of its children nodes have been generated in state space tree of backtracking method.
(a) Dead node (b) Live node (c) E-Node (d) State Node

Ans: Livenode

2. How many nodes are there in a full state space tree with n = 6?
(a) 65 (b) 64 (c) 63 (d) 32

Ans : 63

3. This algorithm scans the list by swapping the entries whenever pair of adjacent keys are out of desired order.
(a) Insertion sort. (b) Bubble sort. (c) Shell sort. (d) Quick sort.

Ans: Bubble sort.

4. From the following chose the one which belongs to the algorithm paradigm other than to which others from the following belongs to.
(a) Minimum & Maximum problem. (b) Knapsack problem. (c) Selection problem.(d) Merge sort.

Ans: Knapsack problem.

5. To calculatec(i, j)'s, w(i, j)'s and r(i, j)'s; the OBST algorithm in worst case takes the following time.
(a) O(log n) (b) O (n4) (c) O (n3) (d) O (n log n)

Ans: O (n3)

6. What is the type of the algorithm used in solving the 4 Queens problem?
(a) Greedy (b) Dynamic (c) Branch and Bound (d) Backtracking.

Ans: Backtracking.

7.In Knapsack problem, the best strategy to get the optimal solution, where Pi, Wi is the Profit, Weight associated with each of the Xi h object respectively is to
(a) Arrange the values Pi/Wi in ascending order (b) Arrange the values Pi/Xi in ascending order
(c) Arrange the values Pi/Wi in descending order (d) Arrange the values Pi/Xi in descending order

Ans: Arrange the values Pi/Xi in descending order

8.Greedy job scheduling with deadlines algorithms' complexity is defined as
(a) O(N) (b) Ω(n log n) (c) O (n2 log n) (d) O (n log n)
Ans: O(N)

9. From the following choose the one which belongs to the algorithm paradigm other than to which others from the following belongs to.
(a) Minimum & Maximum problem (b) Knapsack problem (c) Selection problem (d) Merge sort
Ans : Knapsack problem

UNIT-III

1. From the following pick the one which does not belongs to the same paradigm to which others belongs to.
(a) Minimum & Maximum problem (b) Knapsack problem
(c) Selection problem (d) Merge sort
Ans:Knapsack problem

2. Primsalgorithm is based on _____ method
a. Divide and conquer method c. Dynamic programming
b. Greedy method d. Branch and bound
Ans. Greedy Method

3. The amount of memory needs to run to completion is known as_____
a. Space complexity c. Worst case
b. Time complexity d. Best case
Ans: Space complexity

4. The amount of time needs to run to completion is known as_____
a. Space complexity c. Worst case
b. Time complexity d. Best case
Ans: Time complexity

5. _____ is the minimum number of steps that can executed for the given parameters
a. Average case c. Worst case
b. Time complexity d. Best case
Ans: Best case

6. _____ is the maximum number of steps that can executed for the given parameters
a. Average case c. Worst case
b. Time complexity d. Best case
Ans:Worst case

7. _____ is the average number of steps that can executed for the given parameters
a. Average case c. Worst case
b. Time complexity d. Best case
Ans: Average Case

8. Testing of a program consists of 2 phases which are _____and _____
a. Average case & Worst case b. Time complexity & Space complexity
c. Validation and checking errors d. Debugging and profiling
Ans: Debugging and profiling

9. Worst case time complexity of binary search is _____
a. O(n) b. O(logn)c. Θ(nlogn) d. Θ(logn)
Ans: Θ(logn)

10. Best case time complexity of binary search is _____
a. O(n) c. Θ(nlogn)b. O(logn) d. Θ(logn)
Ans: Θ(logn)

UNIT-IV

1. Tight bound is denoted as _____
   a. Ω c. Θ
   b. Ω d. O
   Ans : Θ
2. Upper bound is denoted as _____
   a. Ω c. Θ
   b. ω d. O
   Ans : O
3. lower bound is denoted as _____
   a. Ω c. Θ
   b. ω d. O
   Ans :Ω
4. The function f(n)=o(g(n)) if and only if Limit f(n)/g(n)=0n->∞
   a. Little oh b. Little omega
   b. Big oh d. Omega
   Ans : Little oh
5. The functionf(n)=o(g(n)) if and only if Limit g(n)/f(n)=0 n->∞
   a. Little oh b. Little omega
   b. Big oh d. Omega
   Ans : Little omega
6. Thegeneralcriteriaofalgorithm;zero or more quantities are externally supplied is_____
   a. Output b. Finiteness
   b. Effectiveness d. Input
   Ans : Input
7. The general criteria of algorithm; at least one quantity is produced _____
   a. Output b. Finiteness
   b. Effectiveness d. Input
   Ans : Output
8. The general criteria of algorithm; Each instruction is clear and unambiguous _____
   a. Output b. Definiteness
   b. Effectiveness d. Input
   Ans : Definiteness
9. The general criteria of algorithm; algorithm must terminates after a finite number of steps _____
   a. Output b. Finiteness
   b. Effectiveness d. Input
   Ans : Finiteness
10. Which is not a criteria of algorithm
    a. Input b. Output
    b. Time complexity d. Best case
    Ans : Best case

UNIT-V

1. job sequencing with deadline is based on _____method
   a. greedy method c. branch and bound
   b. dynamic programming d. divide and conquer
   Ans. Greedy method
2. fractional knapsack is based on _____method

a. greedy method c. branch and bound
b. dynamic programming d. divide and conquer
Ans. Greedy method

3. 0/1 knapsack is based on _____method
a. greedy method c. branch and bound
b. dynamic programming d. divide and conquer
Ans. Dynamic programming

4. The files x1,x2,x3 are 3 files of length 30,20,10 records each. What is the optimal merge pattern value?
a. 110 c. 60
b. 90 d. 50
Ans. 90

5. The optimal merge pattern is based on _____ method
a. Greedy method b. Dynamic programming
c. Knapsack method d. Branch and bound
Ans. Greedy method

6. Who invented the word Algorithm
a. Abu Ja'far Mohammed ibn Musa c. Abu Mohammed Khan
b. Abu Jafar Mohammed Kasim d. Abu Ja'far Mohammed Ali Khan
Ans. Abu Ja'far Mohammed ibn Musa

7. In Algorithm comments begin with_____
a. /* c. /
b. */ d. //
Ans : //

8. The _____ of an algorithm is the amount of memory it needs to run to completion.
a. Space Complexity c. Best Case
b. Time Complexity d. Worst Case
Ans : Space Complexity

9. _____ is the process of executing a correct program on data sets and measuring the time and space it takes tocompute the results.
a. Debugging c. Combining
b. Profiling d. Conqure
Ans : Profiling

10. In Algorithm Specification the blockes are indicated with matching _____
a. Braces c. Square Brackets
b. Parenthesis d. Slashes
Ans : Braces

FILL IN THE BLANKS

UNIT-I

1. The worst case time complexity of the nondeterministic dynamic knapsack algorithm is ___
Ans :O(n)

2. Recursive algorithms are based on_____ approach
Ans :Bottom-up approach

3. What do you call the selected keys in the quick sort method_____
Ans : Pivot key

4. How do you determine the cost of a spanning tree?

Ans :By the sum of the costs of the edges of the tree8.

5. The time complexity of the normal quick sort, randomized quick sort algorithms in the worst case is _____
   Ans :O(n2), O(n2)
6. Let there be an array of length 'N', and the selection sort algorithm is used to sort it, how many times a swap function is called to complete the execution?
   Ans :N-1 times
7. The Sorting methodwhich is used for external sort is _____
   Ans :Radix sort
8. The graph colouringalgorithm's time can be bounded by _____
   Ans :O(nmn).
9. Sorting is not possible by using _____ methods?

(a) Insertion (b) Selection (c) Deletion (d) Exchange

   Ans :Deletion

10. What is the type of the algorithm used in solving the 8 Queens problem?
    Ans :Backtracking

UNIT-II

1. Identify the name of the sorting in which time is not proportional to n2.
   (a) Selection sort (b) Bubble sort (c) Quick sort (d) Insertion sort.
   Ans : Insertion sort
2. The optimal solution to a problem is a combination of optimal solutions to its subproblems. This is known as

. **Ans : Principle of Optimality**

3. Which of the following versions of merge sort algorithm does use space efficiently?
   (a) Contiguous version (b) Array version (c) Linked version (d) Structure version (e) Heap version.
   Ans : Linked version
4. Identify the correct problem for multistage graph from the list given below.
   (a) Resource allocation problem (b) Traveling salesperson problem
   (c) Producer consumer problem (d) Barber's problem
   Ans : Resource allocation problem
5. How many edges are there in a Hamiltonian cycle if the edge cost is 'c' and the cost of cycle is 'cn'
   Ans :n.
6. A problem L is NP-complete iff L is NP-hard and
   Ans : L ε NP
7. What would be the cost value for any answering node of a sub tree with root 'r' using branch-bound algorithm?
   Ans: Minimum

UNIT-III

1. Average case time complexity of binary search is _____
   Ans: Θ(logn)
2. Merge sort invented by _____
   Ans : JOHN VON NEUMANN
3. Quick sort invented by _____
   Ans : CARHOARE
4. Worst case time complexity of Quick sort is _____
   Ans : O(n2)

5. Best case time complexity of Quick sort is _____
   Ans : O(nlogn)
6. Average case time complexity of Quick sort is _____
   Ans : O(nlogn)
7. Which design strategy stops theexecution when it find the solution otherwise starts the problem from top
   Ans: Back Tracking
8. Graphical representation of algorithm is _____
   Ans: Flow Chart
9. In pseudo-code conventions input express as _____
   Ans : Write
10. In pseudo-code conventions output express as _____
    Ans : Read

UNIT-IV

1. Which is not in general criteria of algorithm
   a. Input b. Output
   b. Time complexity d. Effectiveness
   Ans : Time complexity
2. Time complexity of given algorithm is _____

```
Algorithm Display(A)
{
S:=0.0;
For i:=0 to n-1
{
S:=S+A[i];
Return S;
}
}
```

   Ans : 4n+4
3. Time complexity of given algorithm

```
AlgorithmSum(A,S)
{
for i:=1 to n-1
{
for j:=2 to n-1
{
S:=S+i+j;
return S;
}
}
}
```

   Ans :6n2-14n+10
4. kruskal algorithm is based on _____method
   Ans. Greedy method
5. Prims algorithm is based on _____ method
   Ans. Greedy Method
6. The output of Kruskal and Prims algorithm is _____
   Minimum cost spanning tree

UNIT-V

1. Huffmancodes are the applications of _____ with minimal weighted external path length obtained by an optimal set.

Ans : Binary tree

2. From the following which is not return optimal solution

a. Dynamic programming c. Backtracking

b. Branch and bound d. Greedy method

Ans. Backtracking

3. _____ is an algorithm design method that can be used when the solution to a problem can be viewed as the result of a sequence of decisions

Ans : Dynamic programming

4. The name backtrack was first coined by _____

Ans :D.H.Lehmer

5. The term _____ refers to all state space search methods in which all hildren of the – nodes are generated before any other live node can becomethe E-node.

Ans ; Branch and Bound

6. A _____ is a round trip path along n edges of G that visits every vertex once and returns to its starting position.

Ans :Hamiltonian Cycle

7. Graph Coloring is _____ type of algorithm design strategy

Ans : Backtracking

8. Which of the following is not a limitation of binary search algorithm?

a. must use a sorted array

b. requirement of sorted array is expensive when a lot of insertion and deletions are needed

c. there must be a mechanism to access middle element directly

d. binary search algorithm is not efficient when the data elements are more than 1000.

Ans : binary search algorithm is not efficient when the data elements are more than 1000.

9. Binary Search Algorithm cannot be applied to _____

Ans :Sorted linked list

10. Two main measures for the efficiency of an algorithm are

Ans : Time and Space

XI. GATE QUESTIONS:

1. The order of an internal node in a B+ tree index is the maximum number of children it can have. Suppose that a child pointer takes 6 bytes, the search field value takes 14 bytes, and the block size is 512 bytes. What is the order of the internal node?

A) 24B) 25C) 26D) 27

Answer : (C)

2 The best data structure to check whether an arithmetic expression has balanced parentheses is a

A) queue B) stack C) tree D) list

Answer : (B)

3. A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is given below: 10, 8,5,3,2 Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is

A) 10,8,7,5,3,2,1B) 10,8,7,2,3,1,5C) 10,8,7,1,2,3,5D) 10,8,7,3,2,1,5

Answer : (D)

4 The following numbers are inserted into an empty binary search tree in the given order: 10, 1, 3, 5, 15, 12, 16. What is the height of the binary search tree (the height is the maximum distance of a leaf node from the root)?
A) 2B) 3C) 4D) 6
Answer : (B)
5 The goal of structured programming is to
A) have well indented programs B) be able to infer the flow of control from the compiled Code C) be able to infer the flow of control from the program text D) avoid the use of GOTO

statements
Answer : (C)
6 The tightest lower bound on the number of comparisons, in the worst ease, for comparison-based sorting is of the order of
A) nB) n^2C) n log n D) $n \log^2 n$
Answer : (B)
7 Let G be a simple graph with 20 vertices and 100 edges. The size of the minimum vertex cover of G is 8. Then, the size of the maximum independent set of G is
A) 12 B) 8 C) Less than 8 D) More than 12
Answer : (A)
8 Let A be a sequence of 8 distinct integers sorted in ascending order. How many distinct pairs of sequences, B and C are there such that (i) each is sorted in ascending order, (ii) B has 5 and C has 3 elements, and (iii) the result of merging B and C gives A?
A) 2B) 30C) 56D) 256
Answer : (D)
9 A Priority-Queue is implemented as a Max-Heap. Initially, it has 5 elements. The level-order traversal of the heap is given below: 10, 8,5,3,2 Two new elements 1 and 7 are inserted in the heap in that order. The level-order traversal of the heap after the insertion of the elements is
A) 10,8,7,5,3,2,1B) 10,8,7,2,3,1,5C) 10,8,7,1,2,3,5D) 10,8,7,3,2,1,5
Answer : (D)
10 The S-N curve for steel becomes asymptotic nearly at
A) 10^3 cycles B) 10^4cyclesC) 10^6 cycles D) 10^9 cycles
Answer : (C)