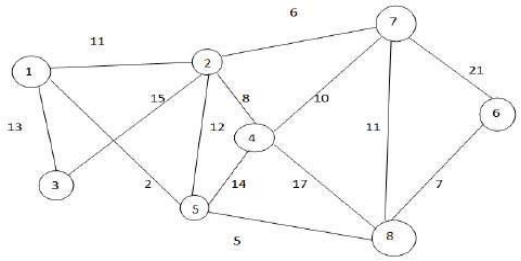
B.Sc. (Hons.) Computer Science
DESIGN AND ANALYSIS OF ALGORITHMS QUESTION BANK
UNIQUE PAPER CODE: 32341401

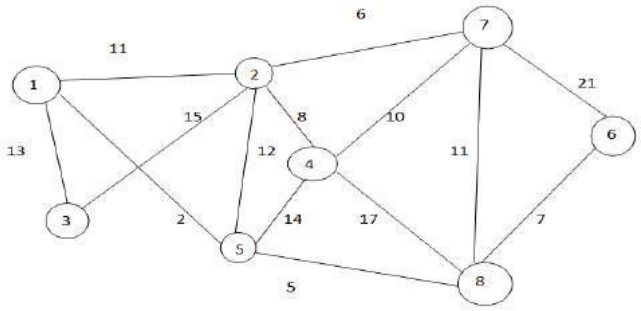
1. Devise an algorithm that sorts a collection of n≥1 elements of arbitrary type.
2. State the best, average and worst case complexities of binary search for successful and unsuccessful search.
3. State the principle of optimality. Find two problems for which the principle does not hold.
4. Determine the frequency counts for all statements in the following algorithm segment.

```
i:=1;
while(i≤n) do
{
x:=x+1;
i:=i+1;
}
```

5. Solve the recurrence relation using substitution method
   T(n)= { T(1) n=1
   aT(n/b)+f(n) n>1 ,where a=5,b=4,and f(n)=cn^2 .
6. Apply quick sort algorithm to sort the list. E, X, A, M, P, L, E in alphabetical order.
7. Analyze the best, average and worst case complexity of quick sort.
8. Compare BFS and DFS algorithm with an example graph and denote its time complexities.
9. Derive time complexity of job sequencing with deadlines .Obtain the optimal solution when *n=5, (p1, p2,…)=(20,15,10,5,1)* and *(d1,d2,…)=(2,2,1,3,3).*
10. Describe about reliability design with an example.
11. Obtain the solution to knapsack problem by Dynamic Programming method n=6, (p1, p2,…p6)=(w1,w2,…w6)=(100,50,20,10,7,3) and m=165.
12. Explain how backtracking is used for solving n- queens problem. Show the state space tree.
13. Describe the algorithm for Hamiltonian cycles and determine the order of magnitude of the worst-case computing time for the backtracking procedure that finds all Hamiltonian cycles.
14. Describe the Travelling sales person problem and discuss how to solve it using dynamic programming.
15. What are the four distinct areas of study of algorithm?
16. Is quick sort a stable sorting method? Justify.
17. Can we say that the time for Merge Sort is Θ*(n log n)*.What is its worst and best time of procedure for Merge Sort.
18. Use an algorithm for greedy strategies for the knapsack to find an optimal solution to the knapsack instance *n*=7,*m*=15*,(p1,p2….,p7)=(*10,5,15,7,6,18,3),and *(w1,w2,…w7)=*(2,3,5,7,1,4,1).
19. Apply greedy algorithm to generate single-source shortest path with an example graph. Mention its time complexity.
20. Write about three popular methods to arrive at amortized costs for operations with.
21. What is stable sorting method? Is merge sort a stable sorting method? Justify.
22. Define spanning tree. Compute a minimum cost spanning tree for the graph of figure using prim's algorithm.



23. What is knapsack problem? State knapsack problem formally.
24. Distinguish Greedy method and Dynamic Programming.
25. Define spanning tree. Compute a minimum cost spanning tree for the graph of figure using kruskal's algorithm.



26. What is back tracking? Where Back tracking is used to solve the problem.
27. What is the difference between 0/1 Knapsack problem and fractional Knapsack problem.
28. Explain the Quick Sort algorithm with an example and also draw the tree structure of the recursive calls made.
29. Explain the Merge Sort algorithm with an e.g. and also draw the tree structure of the recursive calls made.
30. Give the Binary search algorithm and analyze the efficiency.
31. Write an algorithm of BFS? Also give an example.
32. Write an algorithm of DFS? Also give an example.
33. Explain the various criteria used for analyzing algorithms.
34. List the properties of various asymptotic notations.
35. What is the average case complexity of linear search algorithm?
36. Differentiate dynamic programming and divide and conquer.
37. State the time complexity of bubble sort algorithm.
38. Apply backtracking technique to solve the following instance of the subset sum problem S = [1,3,4,5} and d=11 16
39. Explain subset-sum problem and discuss the possible solution strategies using backtracking.
40. What is tree edge and cross edge?
41. Define back edge and tree edge.
42. Explain graph coloring.