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Design and analysis of algorithm (Lovely Professional University)

1. **Which of the following data structures is best suited for implementing a recursive algorithm?**

   a) Array
   b) Linked list
   c) Stack
   d) Queue

   Answer: c) Stack

   Explanation: Recursion works on the principle of Last in First Out (LIFO), which is the same principle followed by the Stack data structure.

2. Which of the following algorithms is an example of a greedy algorithm?

   a) Quick Sort
   b) Dijkstra’s shortest path algorithm
   c) Bellman-Ford algorithm
   d) Kruskal’s algorithm for minimum spanning tree

   Answer: d) Kruskal’s algorithm for minimum spanning tree

   Explanation: Greedy algorithms are those algorithms that make the locally optimal choice at each step in the hope of finding a global optimum. Kruskal’s algorithm is a greedy algorithm as it chooses the edge with the lowest weight and adds it to the minimum spanning tree.

3. Which of the following is a dynamic programming problem?

a) Longest Common Subsequence
b) Binary Search
c) Depth First Search
d) Breadth First Search

Answer: a) Longest Common Subsequence

Explanation: Dynamic programming is a technique where we break a problem down into smaller subproblems and solve each subproblem only once. Longest Common Subsequence is a problem where we break down the problem into smaller subproblems and solve them using dynamic programming.

4. Which of the following sorting algorithms has a worst-case time complexity of O(n^2)?

a) Merge Sort
b) Heap Sort
c) Quick Sort
d) Bubble Sort

Answer: d) Bubble Sort

Explanation: Bubble Sort is an inefficient sorting algorithm with worst-case time complexity of O(n^2).

5. Which of the following algorithms is used to find the strongly connected components in a directed graph?

a) Kruskal’s algorithm

b) Prim’s algorithm
c) Floyd-Warshall algorithm
d) Kosaraju’s algorithm

Answer: d) Kosaraju’s algorithm

Explanation: Kosaraju’s algorithm is used to find the strongly connected components in a directed graph.

6. Which of the following data structures is best suited for implementing a priority queue?

a) Array
b) Linked list
c) Stack
d) Heap

Answer: d) Heap

Explanation: Priority queues are used to maintain a set of elements with keys. A heap is the best data structure to implement a priority queue because it provides efficient insertion, deletion, and retrieval of the minimum (or maximum) element.

7. Which of the following algorithms is used to find the shortest path between two vertices in a graph?

a) Breadth First Search
b) Depth First Search
c) Dijkstra’s shortest path algorithm
d) Bellman-Ford algorithm

Answer: c) Dijkstra’s shortest path algorithm

Explanation: Dijkstra’s algorithm is used to find the shortest path between two vertices in a graph.

1. **8. Which of the following data structures is best suited for implementing a hash table?**
2. a) Array
   b) Linked list
   c) Stack
   d) Queue
3. **Answer: a)** Array
4. **Explanation:** Hash tables are implemented using arrays.
5. **9. Which of the following algorithms is used to find the maximum flow in a flow network?**
6. a) Kruskal’s algorithm
   b) Prim’s algorithm
   c) Ford-Fulkerson algorithm
   d) Bellman-Ford algorithm
7. **Answer: c)** Ford-Fulkerson algorithm
8. **Explanation:** Ford-Fulkerson algorithm is used to find the maximum flow in a flow network.
9. **10. Which of the following algorithms is used to find the minimum spanning tree of a weighted graph?**
10. a) Kruskal’s algorithm
    b) Prim’s algorithm
    c) Floyd-Warshall algorithm
    d) Bellman-Ford algorithm
11. **Answer: a)** Kruskal’s algorithm or b) Prim’s algorithm
12. **Explanation:** Kruskal’s algorithm and Prim’s algorithm are both used to find the minimum spanning tree of a weighted graph. Kruskal’s algorithm works by selecting the edges with

the lowest weight until all vertices are connected, while Prim's algorithm starts with a single vertex and adds the minimum weight edges that connect it to other vertices until all vertices are connected.

13. **11. Which of the following algorithms is used to find the transitive closure of a directed graph?**
14. a) Floyd-Warshall algorithm
    b) Bellman-Ford algorithm
    c) Kosaraju's algorithm
    d) Depth First Search
15. **Answer: a)** Floyd-Warshall algorithm
16. **Explanation:** Floyd-Warshall algorithm is used to find the transitive closure of a directed graph.
17. **12. Which of the following algorithms is used to find the maximum subarray sum?**
18. a) Merge Sort
    b) Heap Sort
    c) Quick Sort
    d) Kadane's algorithm
19. **Answer: d)** Kadane's algorithm
20. **Explanation:** Kadane's algorithm is used to find the maximum subarray sum.
21. **13. Which of the following algorithms is used to find the articulation points in a graph?**
22. a) Bellman-Ford algorithm
    b) Floyd-Warshall algorithm
    c) Depth First Search
    d) Kruskal's algorithm
23. **Answer: c)** Depth First Search
24. **Explanation:** Depth First Search is used to find the articulation points in a graph.

25. **14. Which of the following algorithms is used to find the shortest path between all pairs of vertices in a graph?**
26. a) Breadth First Search
    b) Depth First Search
    c) Dijkstra’s shortest path algorithm
    d) Floyd-Warshall algorithm
27. **Answer: d)** Floyd-Warshall algorithm
28. **Explanation:** Floyd-Warshall algorithm is used to find the shortest path between all pairs of vertices in a graph.
29. **15. Which of the following algorithms is used to find the longest increasing subsequence in a sequence?**
30. a) Merge Sort
    b) Heap Sort
    c) Quick Sort
    d) Dynamic Programming
31. **Answer: d)** Dynamic Programming
32. **Explanation:** The longest increasing subsequence problem can be solved using dynamic programming.
33. **16. Which of the following algorithms is used to find the topological order of a directed acyclic graph?**
34. a) Bellman-Ford algorithm
    b) Floyd-Warshall algorithm
    c) Depth First Search
    d) Kahn’s algorithm
35. **Answer: d)** Kahn’s algorithm
36. **Explanation:** Kahn’s algorithm is used to find the topological order of a directed acyclic graph.
37. **17. Which of the following data structures is best suited for implementing a breadth-first search algorithm?**

a) Array

b) Linked list

c) Stack

d) Queue

Answer: d) Queue

Explanation: Breadth-first search uses a queue data structure to traverse a graph.

18. Which of the following algorithms is used to find the maximum independent set in a graph?

a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Depth First Search

d) Bron-Kerbosch algorithm

Answer: d) Bron-Kerbosch algorithm

Explanation: Bron-Kerbosch algorithm is used to find the maximum independent set in a graph.

19. Which of the following algorithms is used to find the diameter of a tree?

a) Breadth First Search

b) Depth First Search

c) Dijkstra’s shortest path algorithm

d) Kruskal’s algorithm

Answer: b) Depth First Search

Explanation: Depth First Search is used to find the diameter of a tree.

20. Which of the following algorithms is used to find the longest path in a directed acyclic graph?

a) Breadth First Search

b) Depth First Search

c) Dijkstra’s shortest path algorithm

d) Bellman-Ford algorithm

Answer: b) Depth First Search

52. **Explanation:** Depth First Search is used to find the longest path in a directed acyclic graph.
53. **21. Which of the following algorithms is used to find the minimum number of coins needed to make change for a given amount?**
54. a) Greedy algorithm
    b) Depth First Search
    c) Breadth First Search
    d) Dijkstra’s shortest path algorithm
55. **Answer: a)** Greedy algorithm
56. **Explanation:** The minimum coin change problem can be solved using a greedy algorithm.
57. **22. Which of the following algorithms is used to find the maximum flow in a network?**
58. a) Dijkstra’s algorithm
    b) Bellman-Ford algorithm
    c) Ford-Fulkerson algorithm
    d) Prim’s algorithm
59. **Answer: c)** Ford-Fulkerson algorithm
60. **Explanation:** Ford-Fulkerson algorithm is used to find the maximum flow in a network.
61. **23. Which of the following algorithms is used to find the kth largest element in an unsorted array?**
62. a) Quick Sort
    b) Merge Sort
    c) Heap Sort
    d) Selection algorithm
63. **Answer: d)** Selection algorithm
64. **Explanation:** The selection algorithm can be used to find the kth largest element in an unsorted array.

65. **24. Which of the following algorithms is used to find the maximum sum of a subarray with a given sum constraint?**
66. a) Merge Sort
    b) Heap Sort
    c) Quick Sort
    d) Sliding Window algorithm
67. **Answer: d)** Sliding Window algorithm
68. **Explanation:** The maximum sum of a subarray with a given sum constraint can be found using the sliding window algorithm.
69. **25. Which of the following algorithms is used to find the minimum cut in a network?**
70. a) Bellman-Ford algorithm
    b) Floyd-Warshall algorithm
    c) Ford-Fulkerson algorithm
    d) Prim’s algorithm
71. **Answer: c)** Ford-Fulkerson algorithm
72. **Explanation:** Ford-Fulkerson algorithm is used to find the minimum cut in a network.
73. **26. Which of the following algorithms is used to find the longest common subsequence between two sequences?**
74. a) Merge Sort
    b) Heap Sort
    c) Quick Sort
    d) Dynamic Programming
75. **Answer: d)** Dynamic Programming
76. **Explanation:** The longest common subsequence problem can be solved using dynamic programming.
77. **27. Which of the following algorithms is used to find the maximum matching in a bipartite graph?**

a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Hopcroft-Karp algorithm

d) Kruskal’s algorithm

Answer: c) Hopcroft-Karp algorithm

Explanation: Hopcroft-Karp algorithm is used to find the maximum matching in a bipartite graph.

28. Which of the following algorithms is used to find the minimum vertex cover in a graph?

a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Depth First Search

d) Hungarian algorithm

Answer: d) Hungarian algorithm

Explanation: Hungarian algorithm is used to find the minimum vertex cover in a graph.

29. Which of the following algorithms is used to find the maximum weighted matching in a bipartite graph?

a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Hungarian algorithm

d) Kruskal’s algorithm

Answer: c) Hungarian algorithm

Explanation: Hungarian algorithm is used to find the maximum weighted matching in a bipartite graph.

30. Which of the following algorithms is used to find the minimum path cover in a directed acyclic graph?

a) Breadth First Search

b) Depth First Search

c) Dijkstra’s shortest path algorithm

d) Ford-Fulkerson algorithm

Answer: b) Depth First Search

Explanation: Depth First Search is used to find the minimum path cover in a directed acyclic graph.

31. Which of the following algorithms is used to find the minimum spanning tree in a weighted graph?

a) Dijkstra’s algorithm

b) Prim’s algorithm

c) Bellman-Ford algorithm

d) Kruskal’s algorithm

Answer: b) Prim’s algorithm

Explanation: Prim’s algorithm is used to find the minimum spanning tree in a weighted graph.

32. Which of the following algorithms is used to find the all-pairs shortest paths in a weighted graph?

a) Dijkstra’s algorithm

b) Floyd-Warshall algorithm

c) Bellman-Ford algorithm

d) Kruskal’s algorithm

Answer: b) Floyd-Warshall algorithm

Explanation: Floyd-Warshall algorithm is used to find the all-pairs shortest paths in a weighted graph.

33. Which of the following algorithms is used to find the convex hull of a set of points?

a) Graham’s scan

b) Quick Sort

c) Merge Sort

d) Heap Sort

Answer: a) Graham’s scan

Explanation: Graham’s scan is used to find the convex hull of a set of points.

105. **34. Which of the following algorithms is used to find the maximum independent set in a bipartite graph?**
106. a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Depth First Search
d) König’s theorem
107. **Answer: d)** König’s theorem
108. **Explanation:** König’s theorem can be used to find the maximum independent set in a bipartite graph.
109. **35. Which of the following algorithms is used to find the maximum clique in a graph?**
110. a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Depth First Search
d) Bron-Kerbosch algorithm
111. **Answer: d)** Bron-Kerbosch algorithm
112. **Explanation:** Bron-Kerbosch algorithm is used to find the maximum clique in a graph.
113. **36. Which of the following algorithms is used to find the chromatic number of a graph?**
114. a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Depth First Search
d) Greedy algorithm
115. **Answer: d)** Greedy algorithm
116. **Explanation:** The chromatic number of a graph can be found using a greedy algorithm.
117. **37. Which of the following algorithms is used to find the maximum flow in a network with multiple sources and sinks?**
118. a) Dijkstra’s algorithm
b) Bellman-Ford algorithm

c) Edmonds-Karp algorithm

d) Dinic’s algorithm

Answer: d) Dinic’s algorithm

Explanation: Dinic’s algorithm is used to find the maximum flow in a network with multiple sources and sinks.

38. Which of the following algorithms is used to find the shortest path between all pairs of vertices in a graph with negative edges?

a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Floyd-Warshall algorithm

d) Kruskal’s algorithm

Answer: c) Floyd-Warshall algorithm

Explanation: Floyd-Warshall algorithm is used to find the shortest path between all pairs of vertices in a graph with negative edges.

39. Which of the following algorithms is used to find the maximum flow in a network with capacities that are fractional numbers?

a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Edmonds-Karp algorithm

d) Push-Relabel algorithm

Answer: d) Push-Relabel algorithm

Explanation: Push-Relabel algorithm is used to find the maximum flow in a network with capacities that are fractional numbers.

40. Which of the following algorithms is used to find the minimum spanning tree in an undirected graph with negative edges?

a) Dijkstra’s algorithm

b) Prim’s algorithm

c) Bellman-Ford algorithm

d) Kruskal’s algorithm

131. **Answer: c)** Bellman-Ford algorithm

132. **Explanation:** Bellman-Ford algorithm is used to find the minimum spanning tree in an undirected graph with negative edges.

133. **41. Which of the following algorithms is used to find the maximum flow in a network with capacities that can change over time?**

134. a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Edmonds-Karp algorithm

d) Ford-Fulkerson algorithm

135. **Answer: d)** Ford-Fulkerson algorithm

136. **Explanation:** Ford-Fulkerson algorithm is used to find the maximum flow in a network with capacities that can change over time.

137. **42. Which of the following algorithms is used to find the shortest path between two vertices in a graph with negative edges?**

138. a) Dijkstra’s algorithm

b) Bellman-Ford algorithm

c) Floyd-Warshall algorithm

d) Kruskal’s algorithm

139. **Answer: b)** Bellman-Ford algorithm

140. **Explanation:** Bellman-Ford algorithm is used to find the shortest path between two vertices in a graph with negative edges.

141. **43. Which of the following algorithms is used to find the maximum flow in a network with capacities that are integers?**

142. a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Ford-Fulkerson algorithm
143. **Answer: c)** Edmonds-Karp algorithm
144. **Explanation:** Edmonds-Karp algorithm is used to find the maximum flow in a network with capacities that are integers.
145. **44. Which of the following algorithms is used to find the minimum spanning tree in an undirected graph with positive and negative edges?**

a) Dijkstra’s algorithm
b) Prim’s algorithm
c) Bellman-Ford algorithm
d) Kruskal’s algorithm

Answer: c) Bellman-Ford algorithm

Explanation: Bellman-Ford algorithm is used to find the minimum spanning tree in an undirected graph with positive and negative edges.

45. Which of the following algorithms is used to find the maximum flow in a network with capacities that can be increased or decreased by a certain amount?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Push-Relabel algorithm

Answer: d) Push-Relabel algorithm

Explanation: Push-Relabel algorithm is used to find the maximum flow in a network with capacities that can be increased or decreased by a certain amount.

46. Which of the following algorithms is used to find the shortest path between two vertices in a graph with positive and negative edges?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Floyd-Warshall algorithm
d) Kruskal’s algorithm

Answer: b) Bellman-Ford algorithm

Explanation: Bellman-Ford algorithm is used to find the shortest path between two vertices in a graph with positive and negative edges.

47. Which of the following algorithms is used to find the minimum cut in a network with capacities that are integers?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Ford-Fulkerson algorithm

Answer: d) Ford-Fulkerson algorithm

Explanation: Ford-Fulkerson algorithm is used to find the minimum cut in a network with capacities that are integers.

48. Which of the following algorithms is used to find the maximum matching in a general graph?

a) Hopcroft-Karp algorithm
b) Edmonds-Karp algorithm
c) Dinic’s algorithm
d) Ford-Fulkerson algorithm

Answer: c) Dinic’s algorithm

Explanation: Dinic’s algorithm is used to find the maximum matching in a general graph.

49. Which of the following algorithms is used to find the shortest path between all pairs of vertices in a graph with positive and negative edges?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Floyd-Warshall algorithm
d) Kruskal’s algorithm

Answer: c) Floyd-Warshall algorithm

Explanation: Floyd-Warshall algorithm is used to find the shortest path between all pairs of vertices in a graph with positive and negative edges.

50. Which of the following algorithms is used to find the minimum cut in a network with capacities that can change over time?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Ford-Fulkerson algorithm

Answer: d) Ford-Fulkerson algorithm

Explanation: Ford-Fulkerson algorithm is used to find the minimum cut in a network with capacities that can change over time.

51. Which of the following algorithms is used to find the articulation points in an undirected graph?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Tarjan’s algorithm
d) Hopcroft-Tarjan algorithm

Answer: c) Tarjan’s algorithm

Explanation: Tarjan’s algorithm is used to find the articulation points in an undirected graph.

52. Which of the following algorithms is used to find the bridges in an undirected graph?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Tarjan’s algorithm
d) Hopcroft-Tarjan algorithm

Answer: c) Tarjan’s algorithm

Explanation: Tarjan’s algorithm is used to find the bridges in an undirected graph.

53. Which of the following algorithms is used to find the maximum flow in a network with capacities that are real numbers?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Ford-Fulkerson algorithm

Answer: d) Ford-Fulkerson algorithm

Explanation: Ford-Fulkerson algorithm is used to find the maximum flow in a network with capacities that are real numbers.

54. Which of the following algorithms is used to find the maximum flow in a network with capacities that can be increased or decreased by a real number?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Edmonds-Karp algorithm
d) Push-Relabel algorithm

Answer: d) Push-Relabel algorithm

Explanation: Push-Relabel algorithm is used to find the maximum flow in a network with capacities that can be increased or decreased by a real number.

55. Which of the following algorithms is used to find the shortest path between all pairs of vertices in a graph with positive edges?

a) Dijkstra’s algorithm
b) Bellman-Ford algorithm
c) Floyd-Warshall algorithm
d) Kruskal’s algorithm

Answer: c) Floyd-Warshall algorithm

Explanation: Floyd-Warshall algorithm is used to find the shortest path between all pairs of vertices in a graph with positive edges.