Total No. of Questions : 8]

SEAT No. :

P2326

[Total No. of Pages : 2

[5870]-1144
T.E. (Information Technology)
DESIGN & ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester - I) (314445A) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Consider 0/1 knapsack problem N = 3:W=(4,6,8) and P=(10, 12, 15).by using dynamic programming determine the optimal profit for knapsack capacity 10? **[9]**

b) Explain coin change Making problem in detail? **[9]**

OR

Q2) a) Explain how dynamic programming is used to obtain optimal solution for travelling salesperson problem. also explain why this technique is not used to solve TSP for large number of cities? **[9]**

b) What is dynamic programming? Is this the optimization technique? Give reasons what are its drawbacks? **[9]**

Q3) a) Find all possible solutions for 5 queens problem using backtracking.**[9]**

b) Current configuration is (7,5,3,l) for 8 queens problem. Find the answer tuplc using backtracking method. **[8]**

OR

Q4) a) State the principle of backtracking. Explain the constraints used in backtracking with an example. **[9]**

b) What is m colorability optimization problem. Explain with an example.**[8]**

Q5) a) Differentiate between backtracking & branch and bound. Illustrate with example of Knapsack problem. **[9]**

P.T.O.

b) Solve following Job sequencing with deadline problem using Branch and Bound. **[9]**

Job	P	d	t
1	5	1	1
2	10	3	2
3	6	2	1
4	3	1	1

OR

Q6) a) Solve the following instance of the knapsack problem by branch and bound algorithm for W=16. **[9]**

Item	Weight	Value in Rs.
1	10	100
2	7	63
3	8	56
4	4	12

b) Describe the following with respect to B & B **[9]**

- The method
- LC search
- Control abstraction for LC search
- Bounding function

Q7) a) When do you claim that algorithm is polynomial time algorithm? Explain with an example. **[9]**

b) Explain i) Complexity Classes ii) Deterministic Algorithms. **[8]**

OR

Q8) a) Explain Vertex cover problem is in detail. **[9]**

b) What is deterministic algorithm? Write any one deterministic algorithm. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PA-1503

[Total No. of Pages : 3

[5926]-123
T.E. (Information Technology)
DESIGN & ANALYSIS OF ALGORITHMS
(2019 Pattern) (Semester-I) (Elective - I) (314445A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7 or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Write bellman ford algorithm to find the shortest path and analyze it. **[9]**

b) Compare dijkstras algorithm and bellman ford algorithm to find Shortest Path problem? **[9]**

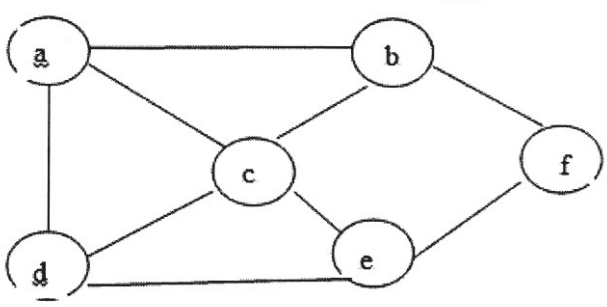
OR

Q2) a) Explain multistage graph problem (using forward computation) in detail? **[9]**

b) Solve the following instances of knapsack problem using dynamic programming for number of object n=4. Knapsack capacity m = 8. **[9]**

Item	1	2	3	4
Weight	2	1	3	2
Value	$12	$10	$20	$15

Q3) a) Find the Hamiltonian cycle by using backtracking method in the given graph. **[9]**



P.T.O.

b) Consider Knapsack problem: n=8, **[8]**
(w1,w2,w3,w4,w5,w6,w7,w8)=(1,11,21,33,43,45,55),
p=(l 1,21,31,33,43,53,55,65) m=110 .Solve the problem using backtracking

OR

Q4) a) Write an algorithm for graph coloring problem using backtracking method. **[9]**

b) Differentiate between backtracking and branch and bound. Draw state space tree. **[8]**

Q5) a) Explain the Branch & Bound algorithmic strategy for solving the problem, take an example of traveling salesman problem using branch & bound. **[9]**

b) Explain the 8 – Queens problem & explain the following with respect to 8 – Queens problem. **[9]**

- State space tree
- Solution state
- State space
- Answer state
- Static tree
- Dynamic tree
- Live node
- Bounding function

OR

Q6) a) Describe the following with respect to B & B. **[9]**

- The method
- LC search
- Control abstraction for LC search
- Bounding function

b) Solve the following instance of the knapsack problem by branch and bound algorithm for W=16. **[9]**

Item	Weight	Value in Rs.
1	10	100
2	7	63
3	8	56
4	4	12

Q7) a) Explain the Clique Problem. **[9]**

b) Give the relationship between P,NP,NP complete, and NP hard problem. **[8]**

OR

Q8) a) What do you mean by P, NP, NP complete and NP hard problem with example. **[9]**

b) What is non-deterministic algorithm. Write any one non-deterministic algorithm. **[8]**

Total No. of Questions : 8]

SEAT No. :

P-485

[Total No. of Pages : 3

[6003]-705

T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHM

(2019 Pattern) (Semester - I) (314445(A)) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates :

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

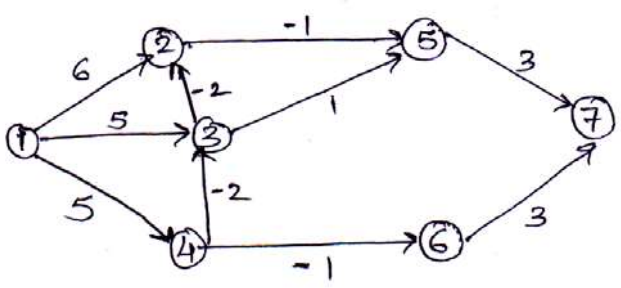
Q1) a) Explain the coin change making problem with suitable example. **[9]**

b) Solve the following instance of Knapsack problem by dynamic programming approach:

n = 6; M = 165 and (pl,p2,p3,p4,p5,p6) = (wl,w2,w3,w4,w5,w6) = (100,50,20,10,7,3). **[9]**

OR

Q2) a) Use Bellman Ford algorithm for finding the shortest path for the graph.**[9]**



b) What is dynamic programing? Is this the optimization technique? What are the drawback of dynamic programing. **[9]**

P.T.O.

Q3) a) Explain 8-Queen problem and explain the following terms with respect to 8-Queens problem. **[8]**

i) State space tree

ii) Live node

iii) Static tree

iv) Solution state

v) Answer state

b) State the principal of backtracking and write backtracking algorithm for graph coloring **[9]**

OR

Q4) a) What is Backtracking? Write an algorithm for backtracking solution to the 0/1 knapsack problem. **[8]**

b) Let W= {5, 10, 12, 13, 15, 18} and M = 30. Find all possible subsets of W that sum to M. Draw the portion of state space tree. **[9]**

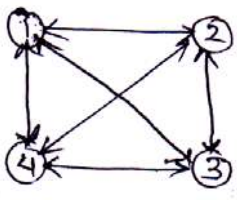
Q5) a) What is the difference between backtracking and branch & bound? Illustrate using the 0/1 knapsack problem. **[9]**

b) Write an algorithm for Least cost(LC) branch & bound. **[9]**

OR

Q6) What is traveling salesperson problem? Find solution to the following TSP using branch & bond. **[18]**

$$\begin{bmatrix} \infty & 10 & 15 & 20 \\ 5 & \infty & 9 & 10 \\ 6 & 13 & \infty & 12 \\ 8 & 8 & 9 & \infty \end{bmatrix}$$



Q7) a) Explain NP-Hard, NP-Complete, Decision problem & Polynomial time algorithm. **[9]**

b) Prove that clique problem is NP complete. **[8]**

OR

Q8) a) Prove that satisfiability problem is NP complete. **[9]**

b) Prove that vertex cover problem is NP complete. **[8]**

Total No. of Questions : 8]

SEAT No. :

P-7621

[Total No. of Pages : 3

[6180]-141

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (314445A) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6, Q7or Q8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Discuss the dynamic programming approach to solving the coin change-making problem. Explain how the problem can be formulated as a dynamic programming task and provide a step-by-step explanation of the algorithm. **[10]**

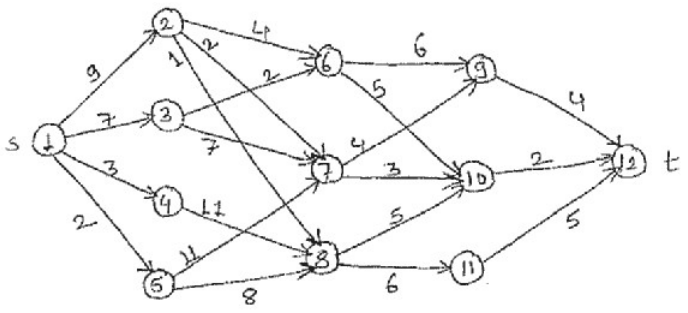
b) Explain the Bellman-Ford algorithm for finding the shortest paths in a weighted directed graph. Discuss the problem it solves, its applications, and its time complexity. **[8]**

OR

Q2) a) Solve the TSP problem using Dynamic Programming. **[10]**

$$\begin{bmatrix} 0 & 10 & 15 & 20 \\ 5 & 0 & 9 & 10 \\ 6 & 13 & 0 & 12 \\ 8 & 8 & 9 & 0 \end{bmatrix}$$

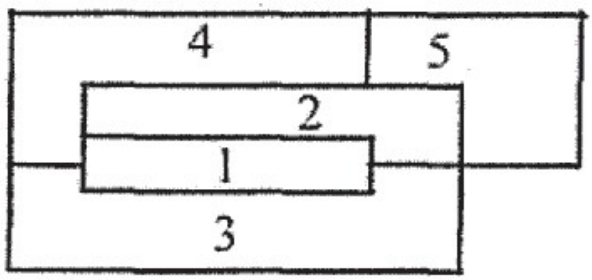
b) Find the minimum cost path from source s to sink t of the following multistage graph. **[8]**



P.T.O.

Q3) a) Write recursive and iterative algorithm for backtracking method. **[8]**

b) Construct planar graph for following map. Explain how to find m - colouring of this planar graph by using m-colouring Backtracking algorithm. **[9]**



OR

Q4) a) Define the n-Queen problem and its objective. Explain the rules and constraints associated with placing n queens on an n × n chessboard without attacking each other. **[8]**

b) Discuss how the backtracking algorithm can be applied to solve the sum of subsets problem. Explain the decision space exploration process with some examples. **[9]**

Q5) Construct the solution of following Travelling Salesperson problem using Branch and Bound. **[18]**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

OR

Q6) a) Write an algorithm for FIFO branch and bound. **[9]**

b) Explain FIFO branch and bound method of problem solving. Explain its advantages and limitations. **[9]**

Q7) a) Prove that Satisfiability problem in NP complete. **[8]**

b) Discuss the proof for the NP-completeness of the Vertex Cover problem. **[9]**

OR

Q8) a) Define the complexity classes P, NP, NP-complete, and NP-hard. Explain the relationships between these classes and their significance in computational complexity theory. **[9]**

b) Prove that clique problem is NP complete. **[8]**

Total No. of Questions : 8]

SEAT No. :

PB-3862

[Total No. of Pages : 2

[6262]-125
T.E. (Information Technology)
DESIGN AND ANALYSIS OF ALGORITHM
(2019 Pattern) (Semester - I) (314445(A)) (Elective - I)

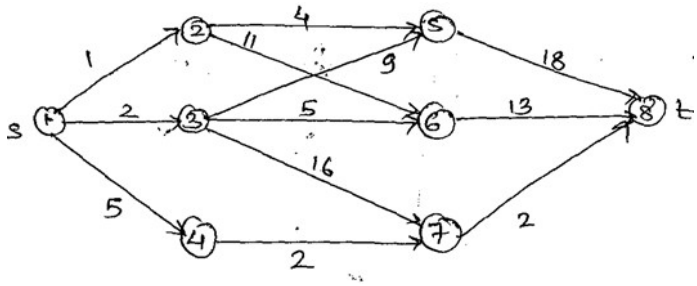
Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Neat diagrams must be drawn wherever necessary.***
2) ***Figures to the right indicate full marks.***
3) ***Assume suitable data, if necessary.***

Q1) a) Define and explain Travelling Salesperson problem using dynamic programming. **[9]**

b) What is Multistage Graph? Find the minimum cost path from source (s) to sink(t) of the multistage graph given below. **[9]**



OR

Q2) a) Explain Principle of Optimality? Differentiate between backtracking and dynamic method. **[9]**

b) Solve the following instance of Knapsack problem by dynamic programming approach:
n = 6, M = 165 and (pl, p2, p3, p4, p5, p6) = (wl, w2, w3, w4, w5, w6) = (100, 50, 20, 10, 7, 3). **[9]**

Q3) a) Explain 8-Queen problem and explain the following terms with respect to 8-Queens problem. **[8]**

i) State space tree
ii) Live node
iii) Static tree
iv) Solution state
v) Answer state

P.T.O

b) Discuss and analyze problem of graph coloring using backtracking with the help of example. **[9]**

OR

Q4) a) State the principle of backtracking and write backtracking algorithm for N-Queen problem. **[8]**

b) Let W = {5, 7, 10, 12, 15, 18, 20} and M = 35. Find all possible subsets of W that sum to M. Construct the portion of state space tree. **[9]**

Q5) a) Explain the following : **[9]**

i) Bounding Function

ii) Branch & Bond

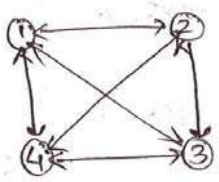
iii) LC search

b) Write an algorithm for FIFO branch & bound. **[9]**

OR

Q6) What is traveling salesperson problem? Find solution to the following TSP using branch & bound. **[18]**

$$\begin{bmatrix} \infty & 10 & 15 & 20 \\ 5 & \infty & 9 & 10 \\ 6 & 13 & \infty & 12 \\ 8 & 8 & 9 & \infty \end{bmatrix}$$



Q7) a) What do you mean by P, NP, NP – Hard and NP complete problem? Give an example of each category. **[9]**

b) Prove that 3-SAT is NP complete. **[8]**

OR

Q8) a) Differentiate between **[9]**

i) P and NP class

ii) NP complete and NP-Hard class

b) Prove that vertex cover problem is NP complete. **[8]**

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Total No. of Questions : 8]

SEAT No. :

PC1805

[Total No. of Pages : 2

[6353]-124

T.E. (Information Technology)

DESIGN & ANALYSIS OF ALGORITHMS

(2019 Pattern) (Semester - I) (Elective - I) (314445A)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right side indicate full marks.***
4) ***Assume suitable data, jf necessary.***

Q1) a) Consider an instance of a Coin change-making problem, with coins 1, 4 and 6 units. Illustrate its solutions using dynamic programming approach involving a payment of 8 units. **[9]**

b) Write an algorithm for 0/1 knapsack problem using dynamic programming. **[9]**

OR

Q2) a) Discuss the dynamic programming approach to solving the coin change-making problem. Explain how the problem can be formulated as a dynamic programming task and provide a step-by-step explanation of the algorithm. **[9]**

b) Explain the Bellman-Ford algorithm for finding the shortest paths in a weighted directed graph. Discuss the problem it solves, its applications, and its time complexity. **[9]**

Q3) a) State the principal of backtracking and write backtracking algorithm for N-Queen problem. **[8]**

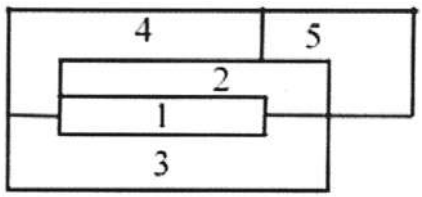
b) Let W = {5, 7, 10, 12, 15, 18, 20} and M = 35. Find all possible subsets of W that sum to M. Construct the portion of state space tree. **[9]**

OR

P.T.O.

Q4) a) Write recursive and iterative algorithm for backtracking method. **[8]**

b) Construct planar graph for following map. Explain how to find m - colouring of this planar graph by using m-colouring Backtracking algorithm. **[9]**



Q5) a) Solve the following instance of 0/1 knapsack problem by FIFO branch and bound approach. N = 4, $(p_1, p_2, p_3, p_4) = (10, 10, 12, 18)$ $(w_1, w_2, w_3, w_4) = (2, 4, 6, 9)$ and M = 15. **[10]**

b) Write the control abstraction for least cost search. **[8]**

OR

Q6) Construct the solution of following Travelling Salesperson problem using Branch and Bound. **[18]**

$$\begin{bmatrix} \infty & 20 & 30 & 10 & 11 \\ 15 & \infty & 16 & 4 & 2 \\ 3 & 5 & \infty & 2 & 4 \\ 19 & 6 & 18 & \infty & 3 \\ 16 & 4 & 7 & 16 & \infty \end{bmatrix}$$

Q7) a) Prove that Satisfiability problem in NP complete. **[8]**

b) Discuss the proof for the NP-completeness of the Vertex Cover problem. **[9]**

OR

Q8) a) Explain deterministic and non-deterministic algorithm with example. **[8]**

b) When do you claim that algorithm is polynomial time algorithm? Explain with an example. **[9]**

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Total No. of Questions : 8]

SEAT No. :

PD4326

[Total No. of Pages : 3

[6403]-124

T.E. (Information Technology)

DESIGN AND ANALYSIS OF ALGORITHM

(2019 Pattern) (Semester - V) (314445A) (Elective - I)

Time : 2½ Hours] *[Max. Marks : 70*

Instructions to the candidates:

1) ***Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8.***
2) ***Neat diagrams must be drawn wherever necessary.***
3) ***Figures to the right indicate full marks.***
4) ***Assume suitable data, if necessary.***

Q1) a) Find out min no. coins to make change of given amount using given coins : Coins {1, 5, 6, 9} **[9]**

W=10

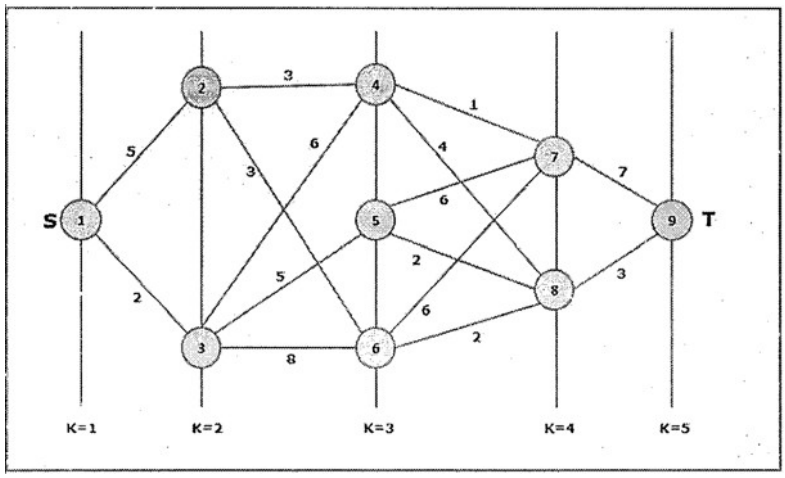
b) Differentiate between dynamic programming method and divide and conquer method along with principle of optimality. **[9]**

OR

Q2) a) Find the optimal solution for the 0/1 knapsack problem making use of dynamic programming approach. **[9]**

Consider- weight [] = {1, 2, 3}, profit [] = {10, 15, 40}, Capacity = 6

b) Find minimum path cost between vertex s and t for following multistage graph using dynamic programming. **[9]**



P.T.O.

Q3) a) How backtracking strategy is useful to solve the graph coloring problem, explain with the help of algorithm and example. **[9]**

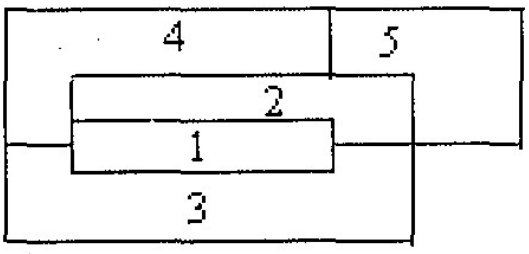
b) Explain the 0/1 knapsack problem. Provide solution to following problem instance using backtracking. **[8]**

N=5, M=12, P1-P5 = (10,15,6,8,4), W1-W5 = (4,6,3,4,2)

OR

Q4) a) Solve the 4-queen Problem. Draw the state space tree for the same. **[9]**

b) Construct planar graph for following map. Explain how to find m - coloring of this planar graph by using m - coloring Backtracking algorithm. **[8]**



Q5) a) What is Traveling Salesman Problem? Find the solution of the following traveling salesman problem using LCBB method. **[9]**

Cost Matrix : $\begin{bmatrix} \infty & 4 & 2 \\ 3 & \infty & 4 \\ 1 & 8 & \infty \end{bmatrix}$

b) Describe the branch and bound algorithm strategy for solving the 0/1 knapsack problem. Where Profit: {10, 10, 12, 18} and Weight: {2, 4,6,9} with m = 15. **[9]**

OR

Q6) a) Discuss the control abstraction of LCBB Branch and Bound with a suitable example. **[9]**

b) Describe branch and bound strategy and its types with example. **[9]**

Q7) a) What are steps to prove NP-completeness of a problem? Prove that vertex cover problem is NP-complete. **[9]**

b) What do you mean by NP Hard and NP Complete problems? Give an Example. **[8]**

OR

Q8) a) Explain P Class and NP Class. **[9]**

b) Write a non-deterministic algorithm for searching key elements and explain that function. **[8]**

x x x