

Q1. Consider the following integer programming model.

$$\begin{aligned} &\text{Maximize } z = -x_1 + 4x_2 \\ &\text{subject to} \\ &-5x_1 + 10x_2 \leq 12 \\ &5x_1 + 10x_2 \leq 49 \\ &x_1 \leq 5 \\ &x_1, x_2 \geq 0 \text{ and integer.} \end{aligned}$$

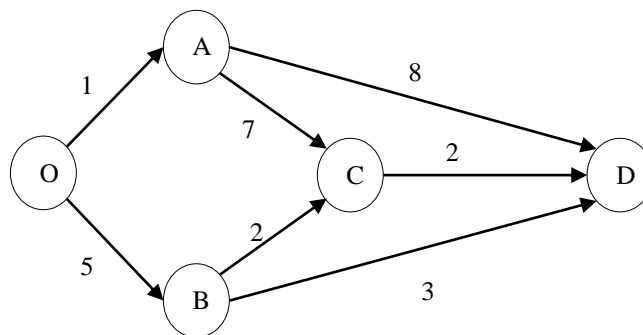
Start your solution by branching on x_1 , find the optimal solution of the given integer programming model using branch-and-bound algorithm.

Q2. Consider the following integer linear programming model.

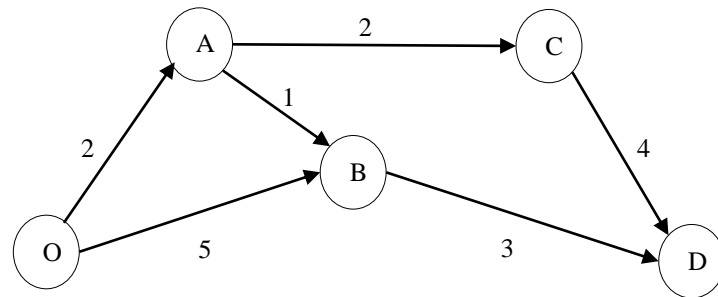
$$\begin{aligned} &\text{Maximize } z = 3x_1 + 4x_2 \\ &\text{subject to} \\ &2x_1 + x_2 \leq 6 \\ &2x_1 + 3x_2 \leq 9 \\ &x_1, x_2 \geq 0 \text{ and integer.} \end{aligned}$$

Start your solution by branching on x_2 , find the optimal solution of the given integer linear programming model using branch and bound method.

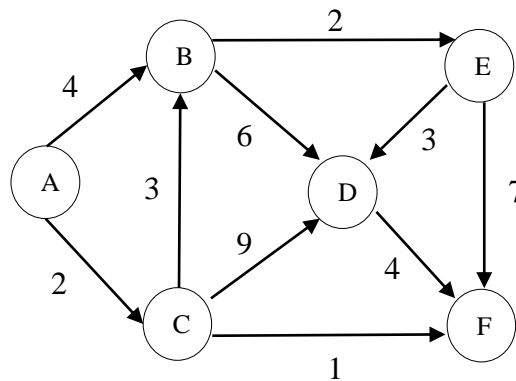
Q3. Determine the best route with shortest distance (kilometers) that need to be traveled by John from city O to city D by using Dijkstra algorithm.



- Q4. Suppose Susan departs from her house (O), determine the short-routes and shortest distance (kilometers) that need to be traveled by Susan to reach area D using Dijkstra algorithm.



- Q5. Determine the maximum flow from node A to node F for the following network by using Ford-Fulkerson algorithm.



- Q6. Determine whether the following statements are true. Justify your answer.

Suppose the maximum (s, t) -flow graph H has size M . If we change H to a flow graph H^+ by increasing the capacity of every edge of H by 2, then the maximum flow for H^+ has value at most $M+2$.