**Question 1:** A steel company has three mills, M1, M2, and M3, which can produce 40, 10, and 20 kilotons of steel each year. Three customers, C1, C2, and C3 have requirements of 12, 18, and 40 kilotons respectively in the same period. The cost, in units of $1000, of transporting a kiloton of steel frame from each mill to each customer is shown in the table.

|  |  |  |  |
| --- | --- | --- | --- |
|  | C1 | C2 | C3 |
| M1 | 11 | 9 | 3 |
| M2 | 7 | 3 | 5 |
| M3 | 9 | 3 | 4 |

Part a) Formulate the problem of carrying out the transportation at minimum cost as a linear programming. Part b) Use transportation simplex technique to solve this problem.

Part c) Assume that we changed the problem to an assignment problem where the goal is to assig mills to customers without considering their production capacities and demands. Use assignment tableau to find the best assignment strategy.

**Question 2:** Given an optimal simplex tableau of a maximization problem and all ≤ constraints and 𝑥4, 𝑥5, 𝑥6

decision variables.

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Basic | Z | 𝑥1 | 𝑥2 | 𝑥3 | 𝑥4 | 𝑥5 | 𝑥6 | Right Side |
| Z | 1 | 0 | 0 | 0 | 3 | 0 | 5 | 𝜃 |
| 𝑥1 | 0 | 1 | 1 | 0 | 2 | 0 | 1 | 2 |
| 𝑥3 | 0 | 0 | 0 | 1 | 1 | 0 | 4 | 2 |
| 𝑥5 | 0 | 0 | -2 | 0 | -1 | 1 | 3 | 1 |

Part a) Give the optimal solution for decision variables. Part b) Give the optimal value for dual decision variables.

Part c) Find 𝛛𝑧

𝛛𝑏1

, Interpret this number.

Part d) If you could buy an additional unit of the first resource for a cost of 5/2, would you do this? Why? Part e) Find the objective value 𝜃.

Part f) Find the range for objective function coefficient of 𝑥2 that will keep the current solution optimal.