

Solve the Following Problems

Problem # 1 (5 Points)

Captain Khalid's Yachts, Inc., located in Florida, rents three types of oceangoing boats: sailboats, cabin cruisers, and the luxury yachts. Each rented boat has one captain, of course, but the crew sizes differ. The crew requirements, in addition to a captain, are one for sailboats, two for cabin cruisers, and three for yachts. Ten employees are captains, and an additional 18 employees fill the various crew positions. Currently, Captain Khalid has rental requests for all of his boats: four sailboats, eight cabin cruisers, and three luxury yachts. Captain Khalid's daily profit contribution is \$50 for sailboats, \$70 for cruisers, and \$100 for luxury yachts. Formulate the problem as linear programming problem.

Problem # 2 (15 Points)

29. Solve the following linear program and identify any alternative optimal solutions.

$$\begin{aligned} \text{Max} \quad & 120x_1 + 80x_2 + 14x_3 \\ \text{s.t.} \quad & 4x_1 + 8x_2 + x_3 \leq 200 \\ & 2x_2 + 1x_3 \leq 300 \\ & 32x_1 + 4x_2 + 2x_3 = 400 \\ & x_1, x_2, x_3 \geq 0 \end{aligned}$$

Problem # 3 (15 Points)

Sun Corporation has a one-year contract to supply motors for all refrigerators produced by the IA Corporation. IA manufactures the refrigerators at four locations around the country: Boston, Dallas, Los Angeles, and St. Paul. Plans call for the following number (in thousands) of refrigerators to be produced at each location:

Boston	50
Dallas	70
Los Angeles	60
St. Paul	80

Sun's three plants are capable of producing the motors. The plants and production capacities (in thousands) are

Denver	100
Atlanta	100
Chicago	150

Because of varying production and transportation costs, the profit that Sun earns on each lot of 1000 units depends on which plant produced the lot and which destination it was shipped to. The following table gives the accounting department estimates of the profit per unit (shipments will be made in lots of 1000 units):

Produced At	Shipped To			
	Boston	Dallas	Los Angeles	St. Paul
Denver	7	11	8	13
Atlanta	20	17	12	10
Chicago	8	18	13	16

With profit maximization as a criterion, Sun's management wants to determine how many motors should be produced at each plant and how many motors should be shipped from each plant to each destination.

- Develop a network representation of this problem.
- Find the optimal solution.

Problem # 4 (5 Points)

Mohamed Trucking Company operates a special pickup and delivery service between Chicago and six other cities located in a four-state area. When Mohamed receives a request for service, it dispatches a truck from Chicago to the city requesting service as soon as possible. With both fast service and minimum travel costs as objectives for Mohamed, it is important that the dispatched truck take the shortest route from Chicago to the specified city. Assume that the following network (not drawn to scale) with distances given in miles represents the highway network for this problem. Find the shortest-route distances from Chicago to the other six nodes.

