

Linear Programming Model

Due Date 5/4/2021

Anderson Family Steakhouse offers a variety of low-cost meals and quick service. Other than management, the Steakhouse operates with full time employees work 8 hrs/ day. The rest of employees are part time employees who are scheduled for 4 hrs shifts during peak mealtimes. On the Saturdays, the Steakhouse is open from 11:00AM to 10:00PM management want to develop a schedule for part time employees that will minimize labor cost and provide excellent customer service. The average wage rate for the part time employees is \$7.60/ hr. The total number of full time and part-time employees needed varies with time of a day as shown.

Time	Total number of employees needed
11:00AM-Noon	9
Noon- 1:00PM	9
1:00PM-2:00PM	9
2:00PM-3:00PM	3
3:00PM-4:00PM	3
4:00PM-5:00PM	3
5:00PM-6:00PM	6
6:00PM-7:00PM	12
7:00PM-8:00PM	12
8:00PM-9:00PM	7
9:00PM-10:00PM	7

One full time employee comes on duty at 11:00 AM works 3 hrs., takes one hr. off, and returns for another 5 hrs. The other full-time employee comes to work at 1:00 PM and works the same 3 hours-on, 1-hour-off, 5-hours-on pattern.

- a. Write the complete linear programming model (objective function and constraints) and develop a minimum cost schedule for part time employees?

- b. What is total payroll for the part time employees? How many part time shifts are needed? (Use the surplus variables to comment on the desirability of scheduling at least some of the part time employees for 3 hrs shifts.)

- c. The restaurant wants to open an extra hour from 10 PM-11 PM with six part time employees needed during this hour. How much does payroll cost change?

- d. Assume that part-time employees can be assigned either 3hr or 4 hr shifts. Write the complete linear programming model and develop a minimum cost schedule for the part time employees. How many part time shifts are needed and what is the cost saving compared to the previous schedule? (restaurant closing time is 10 PM)

- e. The restaurant decides to give part-time employees a raise to \$8.50 per hour. How much does the raise cost in part d?

Use the results of ranges of optimality and feasibility for the Model in part d to answer the following questions:

- f. If the restaurant is busy during the first 2 hours during lunch time and the management wants to add another part timer during those hours, how much the payroll cost will increase? (answer without solving the problem again)

- g. What would it take for X3 and X6 to have a nonzero value in the optimal solution? (Explain)

Hint: Objective function should be the payroll cost.