Module 08 – Scheduling Problem

Exploratory Data Analysis

In this section, you should perform some data analysis on the data provided to you. Please format your findings in a visually pleasing way and please be sure to include these cuts:

- *Make a table (similar to the textbook example) showing the temporary agency data*
- *Run summary statistics on the sample of Full-Time employee salaries. Record the Mean to use in our model*
- *Make a line graph showing foot traffic over the next 12 months. Call out any seasonality or trend you may see.*

Model Formulation

Write the formulation of the model into here prior to implementing it in your Excel model. Be explicit with the definition of the decision variables, objective function, and constraints.

Min= $109,080.02X_1+23,804X_2+23,218X_3+22,668X_4+32,634X_5+39,294X_6+31,926X_7$

$1X_1+0X_2+0X_3+0X_4+0X_5+1X_6+0X_7$=Jan

$1X_1+0X_2+0X_3+0X_4+0X_5+1X_6+0X_7$=Feb

$1X_1+0X_2+0X_3+0X_4+0X_5+1X_6+1X_7$=March

$1X_1+0X_2+0X_3+0X_4+0X_5+0X_6+1X_7$=April

$1X_1+0X_2+0X_3+0X_4+0X_5+0X_6+1X_7$=May

$1X_1+1X_2+0X_3+0X_4+0X_5+0X_6+0X_7$=June

$1X_1+1X_2+0X_3+0X_4+0X_5+0X_6+0X_7$=July

$1X_1+0X_2+0X_3+1X_4+0X_5+0X_6+0X_7$=Aug

$1X_1+0X_2+0X_3+1X_4+1X_5+0X_6+0X_7$=Sep

$1X_1+0X_2+0X_3+0X_4+1X_5+0X_6+0X_7$=Oct

$1X_1+0X_2+1X_3+0X_4+1X_5+0X_6+0X_7$=Nov

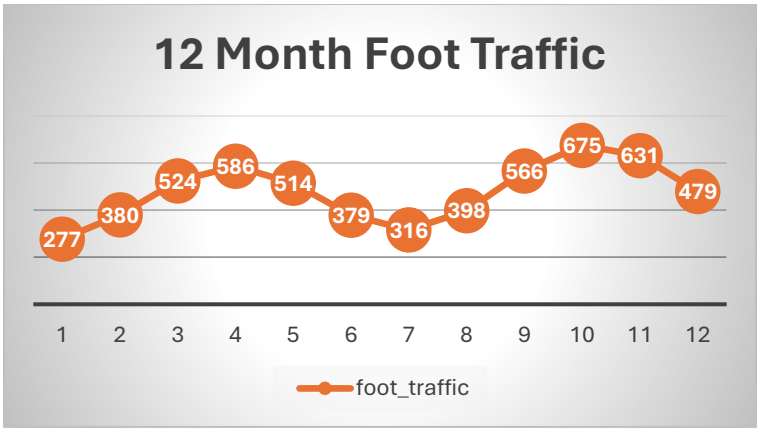
$1X_1+0X_2+1X_3+0X_4+0X_5+0X_6+0X_7$=Dec

	Days On= 1, Days Off= 0													
Workers	**Jan**	**Fed**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Workers Schedule**	**Wages per Worker**
Full-Time	1	1	1	1	1	1	1	1	1	1	1	1	398.00	$ 109,080.02
Tootie Fruity Trading Co.	0	0	0	0	0	1	1	0	0	0	0	0	0.00	$ 23,804.00
Marshmallow Moon	0	0	0	0	0	0	0	0	0	0	1	1	81.00	$ 23,218.00
The Gummy Gazette	0	0	0	0	0	0	0	1	1	0	0	0	0.00	$ 22,668.00
FizzleFizz Sweets	0	0	0	0	0	0	0	0	1	1	1	0	277.00	$ 32,634.00
Whisker Licks	1	1	1	0	0	0	0	0	0	0	0	0	0.00	$ 39,294.00
Candycap Cove	0	0	1	1	1	0	0	0	0	0	0	0	188.00	$ 31,926.00
Available	398	398	586	586	586	398	398	398	675	675	756	479		
Required	277	380	524	586	514	379	316	398	566	675	631	479		
													total	**$ 60,336,211.60**

Model Optimized for Min Costs to Cover Store Foot Traffic

Implement your formulation into Excel and be sure to make it neat. This section should include:

- *A screenshot of your optimized final model (formatted nicely, of course)*
- *A text explanation of what your model is recommending*



Model with Stipulation

Please copy the tab of your original model before continuing with the next part to avoid messing up your original solution.

	Days On= 1, Days Off= 0													
Workers	**Jan**	**Fed**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Workers Schedule**	**Wages per Worker**
Full-Time	1	1	1	1	1	1	1	1	1	1	1	1	318.00	$ 109,080.02
Tootie Fruity Trading Co.	0	0	0	0	0	1	1	0	0	0	0	0	61.00	$ 23,804.00
Marshmallow Moon	0	0	0	0	0	0	0	0	0	0	1	1	161.00	$ 23,218.00
The Gummy Gazette	0	0	0	0	0	0	0	1	1	0	0	0	80.00	$ 22,668.00
FizzleFizz Sweets	0	0	0	0	0	0	0	0	1	1	1	0	357.00	$ 32,634.00
Whisker Licks	1	1	1	0	0	0	0	0	0	0	0	0	62.00	$ 39,294.00
Candycap Cove	0	0	1	1	1	0	0	0	0	0	0	0	268.00	$ 31,926.00
Available	380	380	648	586	586	379	379	398	755	675	836	479		
Required	277	380	524	586	514	379	316	398	566	675	631	479		
													total	**$ 64,333,762.07**

318.4

	Days On= 1, Days Off= 0													
Workers	**Jan**	**Fed**	**March**	**April**	**May**	**June**	**July**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**Workers Schedule**	**Wages per Worker**
Full-Time	1	1	1	1	1	1	1	1	1	1	1	1	398.00	$ 109,080.02
Tootie Fruity Trading Co.	0	0	0	0	0	1	1	0	0	0	0	0	0.00	$ 23,804.00
Marshmallow Moon	0	0	0	0	0	0	0	0	0	0	1	1	81.00	$ 23,218.00
The Gummy Gazette	0	0	0	0	0	0	0	1	1	0	0	0	0.00	$ 22,668.00
FizzleFizz Sweets	0	0	0	0	0	0	0	0	1	1	1	0	277.00	$ 32,634.00
Whisker Licks	1	1	1	0	0	0	0	0	0	0	0	0	0.00	$ 39,294.00
Candycap Cove	0	0	1	1	1	0	0	0	0	0	0	0	188.00	$ 31,926.00
Available	398	398	586	586	586	398	398	398	675	675	756	479		
Required	277	380	524	586	514	379	316	398	566	675	631	479		
													total	**$ 60,336,211.60**

$ 9,090.00	$ 7,448.92
Including temporary	Full time

Please do both of the following:

1. *Unfortunately, leadership wishes to have a reduction in workforce. While the monthly salary for full time employees is cheaper than temporary workers, there are other costs associated with full time employees that they wish to cut. Add a constraint to your model that takes your first model's recommended number of full-time employees and constrains it to be only 80% of it. Add a text explanation of the change in the optimal value as well as any other changes noticed between the models.*

2. *Alternatively, leadership would like to see what the average monthly salary for an employee would need to be to cut out all temporary workers as they believe that will help negate excess spending. Convert your model (or do the math out yourself) to*

figure out what monthly salary you would need to pay your full-time employees to only have full-time workers at the same optimal cost as the original model.

3. *Considering trends and seasonality of this business, what would you recommend leadership to do? Feel free to play with the model and recommend something else.*

- Temporary workers/employees utilized strategically to match coverage shortages during high-demand months (March, June, July, October, November, December).
- Full-time workers/employees offered better cost-efficiency per month but incur a higher long-term overhead.

What would I recommend?

- Trying to maintain that 318 full-time workers/employees.
- Utilize temporary workers/employees in these months (March, June, July, October, November, December) to fill gaps, as they bring flexibility without the commitment of full-year salaries.
- Also consider offering season contracts or part-time benefits to repeat temporary workers/employees during the peak months to reduce turnover and onboarding costs.
- Optimizing any further by analyzing month-specific overstaffing or understaffing and adjusting scheduling patterns for full-time workers.

full time	monthly salary	yearly
Mean	$ 9,090.00	$109,080.02
Max	$ 12,860.86	$154,330.32
Min	$ 2,794.07	$ 33,528.84

Agency	Months Off	Monthly Salary
Tootie Fruity Trading Co.	Aug-May	11902
Marshmallow Moon	Jan-Oct	11609
The Gummy Gazette	Oct-July	11334
FizzleFizz Sweets	Dec-Aug	10878
Whisker Licks	April-Dec	13098
Candycap Cove	June-Feb	10642