

Service Processes and Systems Homework #7

Assigned: Apr. 15, 2006

Due: Apr. 24, 2006

1. Western National Bank wants to provide a drive-through service for customers. Management estimates that customers will arrive at the rate of 15 per hour on the average. The teller who will staff the window can serve customers at the rate of 20 per hour on the average.

Assuming:

Arrivals distribution → Poisson

Service distribution → Negative Exponential

Find:

- a. Capacity utilization of the teller
- b. Average number of cars in the waiting line
- c. Average number in the system
- d. Average waiting time in line
- e. Average time in the system, including service

2. A student has many tasks that need to be completed. These tasks, their processing times (in days), and their due dates (days) are as shown in the table.

Task	Processing Time	Due Date
A	3	5
B	9	8
C	2	2
D	8	6
E	6	9
F	4	4
G	1	1
H	7	7
I	5	3

For both the SPT and EDD scheduling rules, prioritize the tasks in the table above and prepare a table such as that developed in class that has the following column headings: Task, Processing Time, Due Date, Start Time, Completion Time, Lateness, and Waiting Time. Compare the results of the two schedules in terms of average completion time, average lateness, and average waiting time.

3. Joe's Auto Seat Cover and Paint Shop is bidding on a contract to do all the custom work for Smiling Ed's used car dealership. One of the main requirements in obtaining this contract is rapid delivery time. Ed has said that if Joe can refit and repaint five cars that Ed has just received in 24 hours or less, the contract will be his. The following times (in hours) are required in the refitting shop and the paint shop for each of the 5 cars. Assuming that cars go through the

refitting operations before they are repainted, can Joe meet the time requirements and get the contract? (include a bar graph – such as that shown in class – in your answer).

Car	Refitting Time (hours)	Repairing Time (hours)
A	6	3
B	0	4
C	5	2
D	8	6
E	2	1

4. The demand for a new tofu-burger at the Burger Barn is shown in the table:

Day	Demand, Burgers
Monday	22
Tuesday	27
Wednesday	38
Thursday	32
Friday	34

What is the forecast demand for next Monday using a smoothing constant $\alpha = 0.3$?

5. A health clinic is being planned to serve a rural area in west Texas. The service area consists of four communities at the following X-Y coordinate locations in miles: A(6,2), B(8,6), C(5,9), D(3,4), with populations of 2000, 1000, 3000, and 2000, respectively. Recommend a “cross-median” location for the health clinic minimizing the total weighted metropolitan distance traveled.

6. When returning on a flight from overseas, a sequence of immigration and customs-clearing activities are required before a passenger can board a domestic flight for home. The table below lists the activities and their average times. Except for baggage claim, these activities must be performed in the sequence noted. What is the bottleneck activity and maximum number of passengers who can be processed per hour? What would you recommend to improve the balance of this process? (use the diagrams such employed in class to illustrate the problem and your proposed improvement)

Activity	Average Time, Sec.
1. Deplane	20
2. Immigration	16
3. Baggage claim	40
4. Customs	24
5. Check baggage	18
6. Board domestic flight	15

7. “Tia Rosa” tortillas are made along the US-Mexico border in 4 different facility locations: Tucson AZ, San Diego CA, McAllen TX, and El Paso TX. These facilities have the following tortilla-making capacities 18000, 22000, 15500 and 20500 kg/year respectively. The cities where the tortillas are shipped to are Chicago IL, Los Angeles CA, and Houghton MI, with the following demands: 25000, 45000, 6000 kg/year respectively. The transportation cost per kg of tortillas is 3 cents per mile. Using the mileage information in the following chart, develop the LP model and find the optimum solution. (hint: use MatLab or Maple to solve the model). Be sure to indicate both the network flows and the minimum cost.

	Chicago	Los Angeles	Houghton
San Diego	2080	122	2355
McAllen	1522	1641	1896
El Paso	1605	803	1993
Tucson	1843	489	2231

8. Consider the problem of assigning five operators to five machines. The assignment costs in dollars are given below. Find the optimal assignment.

		Machine				
		1	2	3	4	5
Operator	1	5	4	7	3	8
	2	5	2	6	8	6
	3	1	10	9	3	5
	4	10	6	2	4	7
	5	7	8	3	1	4

For Graduate Credit:

Identify a technical paper that applies Facility Location or Facility Layout to a service process.

Prepare a critical review of the paper. What are the positive contributions of the paper? What are the technical deficiencies of the paper? Be sure to include a copy of the paper with your submission.