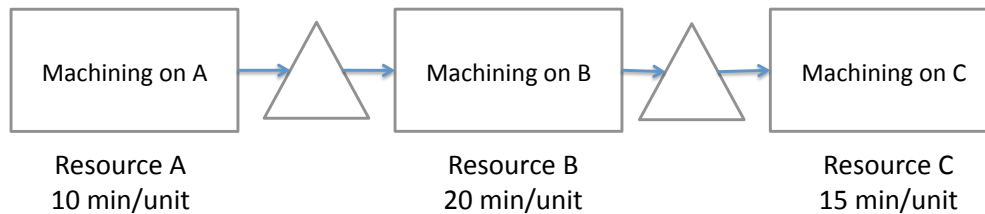


University of British Columbia  
Sauder School of Business  
COMM 399: Logistics and Operations Management

SAMPLE MIDTERM

1. Below is a flow diagram for the production process of Excellent Manufacturing, Inc. Currently, the process is being used to make Product Valentine. Production times (per unit) are included on the diagram.



- (a) What is the maximum throughput rate for Product Valentine?
- (b) What is the cycle time of this process?
- (c) What is the theoretical flow time?
- (d) Assume that the operator of machine C has come up with an innovation that has reduced processing time from 15 minutes to 10 minutes. As a result, the throughput rate will (circle one)
- i. increase
  - ii. decrease
  - iii. remain the same
- (e) Assume that the operator of machine C has come up with an innovation that has reduced processing time from 15 minutes to 10 minutes. As a result, the flow time will (circle one)
- i. increase
  - ii. decrease
  - iii. remain the same
- (f) When the demand rate = capacity rate of the process, what is the short run utilization of
- i. Resource A:
  - ii. Resource B:
  - iii. Resource C:
2. A car repair shop has two hoists where cars can be lifted for repair work. Currently, customers leave the car (after finishing their repairs) at the rate of 4 per hour. On average 8 cars are waiting to be processed.
- (a) How long do customers wait on average before being processed?

- (b) Some of the customers need routine repairs and other need major repairs. The repair shop owner feels that he is losing many customers needing routine repair because of the long wait, and therefore dedicates one hoist for routine repair and one for major repairs. A study indicates that the throughput rate for routine repairs is 3 per hour and throughput rate for major repairs is 1 per hour. On average, 5 people are waiting for routine repairs and 3 on average are waiting for major repairs. How long does each type of customer now wait before being served?
3. Gracias Restaurant is located in downtown Vancouver. The restaurant has 50 tables at which it can serve customers. The flow unit through Gracias is a “party”, which is a group of one or more people who arrive, get seated at a table, eat and depart. On average, a party takes 60 minutes to eat dinner, and then another 20 minutes to eat dessert. (We will use the term “dessert” to refer to any after-dinner item, such as sweets, coffee, other drinks, and so on.) The average party generates a contribution margin (revenue minus variable cost) of \$80 on dinner, and \$20 on dessert.
- (a) If all parties have both dinner and dessert, what is the capacity rate (parties per hour) of the restaurant?
- (b) At what rate (dollars per hour) is margin generated by the restaurant if it is operating at capacity?

Now assume that Gracias has leased space to open a “dessert bar” next door, and has opened up the wall between the two to allow inside access from the restaurant to the dessert bar. The dessert bar has 35 tables. Now, a party arrives and is seated at a table in Gracias as usual. However, when the party has finished eating dinner, the server asks them if they would please move to the dessert bar for dessert.

- (c) Assuming that all parties eat both dinner and dessert, what is the capacity rate (parties per hour) of the total system (restaurant and dessert bar)?
- (d) At what rate (dollars per hour) is margin generated by the system if it is operating at capacity?
4. Your company has just received an order for a specially designed electric motor. The contract states that if the project is not completed 12 days from now, then beginning on the 13th day, your firm will experience a penalty of \$300 per day. The table below shows the activities that need to be completed for this project, along with data on direct costs and precedence relationships. (Crash Time represents the minimum time of each activity if it was completely crashed; the Crash Cost represents the cost of each activity if it is crashed to its minimum.)

Activity	Normal Time (days)	Normal Cost (\$)	Crash Time (days)	Crash Cost (\$)	Immediate Predecessors
A	4	1000	3	1300	None
B	7	1400	4	2000	None
C	5	2000	4	2700	None
D	6	1200	5	1400	A
E	3	900	2	1100	B
F	11	2500	6	3750	C
G	4	800	3	1450	D, E
H	3	300	1	500	F, G

- (a) Draw the network diagram.
  - (b) What completion date do you recommend for the project? (Hint: It will be better to incur the penalty cost, if the cost of reducing the duration of the project is greater than \$300.) What is the project cost for that project length?
5. A bank installs an ATM and observes that the customers arrive at a rate of 15 per hour and the arrivals follow a Poisson distribution. The ATM has a fixed non-random service time of 3 minutes per customer.
- (a) Calculate the average time spent by a customer in this system.
  - (b) What is the percentage of time that the ATM is idle?
  - (c) Over time, the ATM machine becomes slower. If the ATM machine slows down and requires 5 minutes per customer, what happens to the utilization?
  - (d) When this ATM machine breaks down, the bank resorts to a teller system. The teller takes 1 minute to serve half his customers and 5 minutes for the other half. (Thus, each customer requires either 1 minute or 6 minutes of service.) Who is more idle, the teller or the ATM?