commerce undergraduate society

COMM 204

MIDTERM REVIEW SESSION

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CMP

I. Basic Information

1. E
2. D

II. Process Flow Analysis

1. a) True

   The bottleneck resource is always the resource with the minimal capacity rate. Therefore, if there is more than one bottleneck resource, they must all have the minimal capacity rate and so their capacity rate must be the same.

   b) True

   The unit load on a non-bottleneck resource has to be smaller than the unit load of the bottleneck resource, which is also the cycle time. So in each cycle, the non-bottleneck resource must have some time idled.

   c) False

   Manager could also get information on input rate (customer arrivals) and schedule the operators to meet the variable input rate.

   d) False

   Cycle time is equal to the time spent on the bottleneck resource, which must be smaller or equal to the flow time.

   e) True

   In the short run, if output rate>input rate, the rest is from the inventory. However, in the long run, the inventory is finite, so the long run average output cannot be larger than the long run average of the input rate.

2.
   a. For auto policies the process has a single step. Theoretical flow time is 20 minutes.
   b. For homeowners' insurance application, there are two paths: A1-A2-A4 = 15+25+20 = 60 minutes & A1-A3-A4 = 15+15+20 = 50 minutes. Because 60>50, the first path is the critical path.
   c. 60/17 = 3.53.
   d. Tina is the bottleneck.
   e. Shorten A3 will lower Tina's unit load by 0.6*2 = 1.2 minutes. Shortening A5 lowers her unit load by 0.4*2=0.8 minutes. Therefore, shortening A5 results in the biggest increase in the bottleneck's capacity.

3. a. The current capacity of the entire process is 28/hr.

b. The bottleneck is the portion of the production chain that produces the least and limits how much the whole production process is able to produce. Thus, in steps 1-2-3, the bottleneck is at operation 2 at 17/hr. In steps 4-5-6, the bottleneck is at operation 5 at 11/hr. Therefore, the capacity of the combined parallel production lines is 17/hr + 11/hr = 28/hr. Since 28/hr is weaker than the production capacity of steps 7 and 8, the current capacity of the entire process is 28/hr.

c. I would increase the capacity by increasing the bottleneck in either steps 1-2-3 or steps 4-5-6 because the bottleneck is where the capacity of the entire process is limited. If we increase the bottleneck in steps 1-2-3, which means changing the capacity of operation 2 from 17/hr to 20/hr, the resulting capacity of the entire process would be 20/hr + 11/hr = 31/hr. If we increase the bottleneck in steps 3-4-5, which means changing the capacity of operation 5 from 11/hr to 12/hr, the resulting capacity of the entire process would be 17/hr + 12/hr = 29/hr. Since producing at 31/hr is evidently better than producing at 29/hr, I would increase capacity of operation 2 from 17/hr to 20/hr, with the resulting capacity of the entire process at 31/hr.

III. Multiple Types and Product Process Matrix

1.

	One of a kind of few	Low volume, high variety products	High volume, standard products	High volume, commodity products
Job shop	C, E, F			
Batch		D		
Flow shop			G	
Continuous flow				A,B

2.

	Flow shop	Job shop
Variable production cost	Low	High
Labour specialization	High	Low
Size of facilities	Larger	Smaller
Flow time	Shorter	Longer
Volume	High	Low
Product variety	Low	High
WIP inventory	Low	High
Level of automation	High	Low
Capital investment	High	Low

IV. Variability in Processes

1. False. Little's Law is for long run averages. In random short time scenario, I=RT not necessarily holds. Example: a shop opens at 9am. Before 9am, some customers already arrived and waited outside. Then, the throughput rate before 9am is zero. Then by Little's Law, the inventory has to be zero. But there are customer waiting!

2. Inventory: customers line up for burgers, but this inventory is costly because customers may get frustrated that they waited for so long and decide not to line up again next time. You can increase actual inventory of cooked burgers the day before, but this may affect the quality of

the food and the brand.

Capacity: if you hire another worker or new grill, you can increase your capacity and quickly cook up a larger number of burgers when the place gets busy.

Information: consider having people pre-order their burgers from the road. Create a phone application so that customers can fill in exactly what they want and their distance from the stand. The orders are completed right before the customer arrives.

3. Given that the service time is 3 min per customer, μ = 20 customers / hour and we know that λ = 15 customers/hour. Therefore, p=15/20 =75%. We can find that Iq= p^2/(1-p) = 2.25 customers, which is relatively short. Your guess is wrong.

4. M/M/1 Queue

   λ = 10 vehicles/minute

   μ = 12 vehicles/minute

   a) Iq= 10^2/[12(12-10)] = 4.17 vehicles
   b) Is = 10/(12-10) = 5 vehicles
      By Little's Law, Ts = Is/λ= 5/10 = 0.5 minutes
   c) 10/12 = 0.8333 = 83.33%
   d) P0 = 1-10/12 = 0.1667
      P1=(1-10/12)(10/12)^1 = 0.1389
      P2 = (1-10/12)(10/12)^2 = 0.1157
      Probability = 1 – (0.1667+0.1389+0.1157) = 0.5787