(COURSE CODE) REVIEW SESSION

ANSWER KEYS

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1. (D)
2. It means that the process is not well designed, there may exist inefficiency.
3. Process blocking often happened on the resources previous to the bottleneck one because the unit load of bottleneck resources are always the highest and will let flow units to build up before it go through the bottleneck resources. Process starving often happened on the resources after the bottleneck one, and adding a buffer won't help here.

4. b
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Unit loads   A: 10 min   C: 15 min   D: 20 min

B: 12 min

Capacity rate   A: 6/hr   C: 4/hr   D: 6/hr (2*3)

B: 5/hr

b. Capacity rate = 4 units/hour, bottleneck is Task C, utilization of task D=3/6=50%.

c. Disagree, because 50% increase in capacity means we want to achieve a capacity of 6 Pokémon balls per hour, since task B processes 5 units per hour, it becomes the new bottle neck, and the target cannot be achieved.

5. a. Students

b.

Time Period	Input	Capacity	Output	Inventory at the end of each period
7am-8am	100	0	0	100
8am-9am	200	0	0	300
9am-10am	400	0	0	700
10am-11am	400	300	300	800
11am-12am	200	300	300	700
12am-13pm	100	300	300	500
13pm-14pm	50	300	300	250
14pm-15pm	50	300	300	0
Average				418.75

Inventory at the end of each period

c. Choose (B), that is, 9:00 am.

d. It is possible, since the service starts at 10:00 and ends at 15:00, in total 5 hours of service time, and 5 x 300students/h=1500 students; therefore possible.

6.

Aspects	Job shop	Flow shop
Level of automation	Low	High
Facility scale	Small	Large
Equipment specialization	Low	High
WIP inventory level	High	Low
Primary competitive advantage	Service design (ability to meet idiosyncratic needs)	Low cost

7. Given that service time is 6 min/customer, μ= 10 customer /hour, and we know that λ=11.9 customers/hour. Therefore, p=9.9/10=99%. The utilization is almost 100%, we can find that $I_q=\rho^2/(1-\rho)$ =98.01 customers, which is very long for services from a investment company.

8. We know this is a M/M/1 question, with λ=5/h and μ= 6/h.
   (a). By the P-K formula, Iq=4.17 customers waiting.
   (b). By Little's Law, Tq=Iq/λ=4.17/5=83.33 h, or 50minutse.
   (c). Since Ts=1/μ, T=Tq+Ts=50 + 10=60minutes.
   (d). p=λ/μ=83.33%

9. (a). p= λ/cμ=150/(60x3)=150/180=83.33%
   (b). Iq=p^[root (2(3+1))]/(1-p)=3.583; Tq=Iq/λ=3.583/(150/month)=0.71 day; since 0.71<1, not necessary to build another machine.

10. (a).
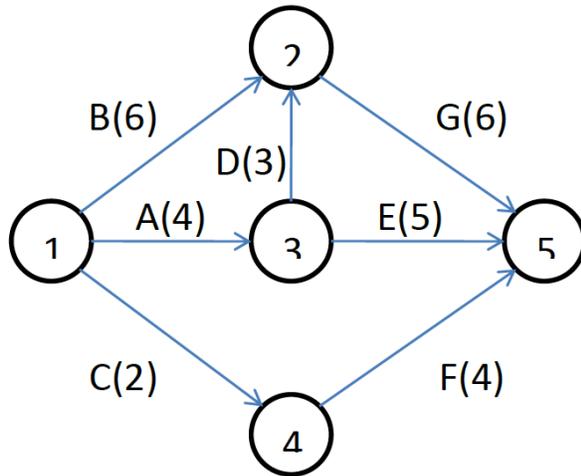
(b). Completion time=13; Cost =560

(c). Critical path is A-D-G

(d). 1 day-Cost is 10; 2days-cost is 20.

(e). 6