PERFORMANCE EVALUATION EXERCISES

QUEUING

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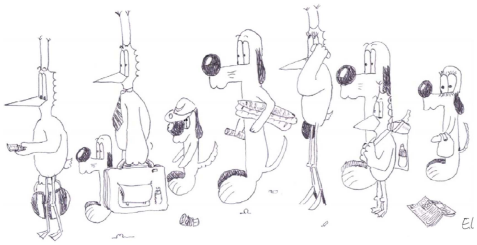


1. An information server can be modelled as an M/GI/1 queue. Doubling the capacity of the server would...

   (a) ☐ Reduce the mean queuing time by a factor 2

   (b) ☐ Reduce the mean queuing time by a factor larger than 2

   (c) ☐ Reduce the mean queuing time by a factor smaller than 2

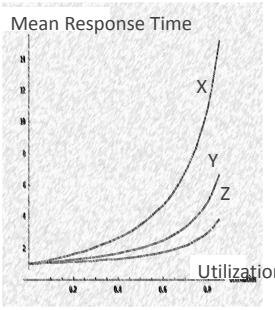
   (d) ☐ It depends on the utilization factor

2. The 3 curves are for an M/GI/1 queue with different distributions of the service time S. Say which curve is for which distribution.

   B Rescaled Bernoulli with $p = 0.2$, i.e. $S = s$ with probability $p = 0.2$ and $S = 0$ with probability $1 - p$.

   C Constant

   E Exponential



	X	Y	Z
(a) ☐	B	C	E
(b) ☐	B	E	C
(c) ☐	C	B	E
(d) ☐	E	B	C
(e) ☐	C	E	B
(f) ☐	E	C	B

3. Which sentences are true ? $\lambda =$ arrival rate, $\bar{S} =$ mean service time.

   A For a single server queue, if $\lambda < \frac{1}{\bar{S}}$ the queue has a stationary regime.

   B For an M/GI/1 queue, if $\lambda < \frac{1}{\bar{S}}$ the queue has a stationary regime.

   (a) ☐ A

(b) ☐ B

(c) ☐ Both

(d) ☐ None

4. A train with 200 tourists arrive at the skilift. A queue builds up. Doubling the capacity of the skilift would...

   (a) ☐ Reduce the queuing time by a factor 2

   (b) ☐ Reduce the queuing time by a factor larger than 2

   (c) ☐ Reduce the queuing time by a factor smaller than 2

   (d) ☐ It depends on the utilization factor

5. The average number of customers present in an M/GI/∞ queue is ($\bar{S}$ is the mean service time) ...

   (a) ☐ $\bar{N} = \lambda \bar{S}$

   (b) ☐ $\bar{N} = \frac{\rho}{1-\rho}$ with $\rho = \lambda \bar{S}$

   (c) ☐ None of the above, the result depends on the distribution

   (d) ☐ There is no closed form formula

6. At a GI/GI/1 FIFO queue, the expected waiting time for a job, given that its service time is s, is...

   (a) ☐ Independent of s

   (b) ☐ Proportional to s

   (c) ☐ Dependent on s but not proportional (in general)

7. At a M/GI/1 Processor Sharing queue, the expected response time for a job, given that its service time is s, is...

   (a) ☐ Independent of s

   (b) ☐ Proportional to s

   (c) ☐ Dependent on s but not proportional (in general)

8. The European Commission has 50 anti-dumping cases on file and opens 20 cases a year. What is the average case duration ?

9. The autolib company has a fleet of electric cars and one single charging station. Every car visits the charging station to charge its batteries. Only one car can be charged at a time, other cars wait in a queue. The charging time is 30 mn. Every car spends in average 2 hours when it is charged before returning to the charging station. There are N cars in total. Can you approximately plot (1) the average waiting time at the charging station (2) the intensity of visits to the charging station as a function of N ? (3) Can you estimate the worst case waiting time ?