Questions

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Question 1

0.0/1.0 point (graded)

The PASTA property means that, for a queue with Poisson input traffic:

the probability of losing a client is the probability that the server is empty,

- True
- False

the probability that the server is occupied is equal to the load in Erlang,

- True
- False

the service times are exponentially distributed,

- True
- False

the probabilities seen by clients at the time that they arrive correspond to the stationary probabilities,

- True

- False

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Question 2

1 point possible (graded)

A system is modelled by a FIFO finite queue with a single server. The probability that the system is full is observed to be 10^{-3}. The client rejection probability is observed to be 10^{-4}.

The inter-arrival may be exponentially distributed.

- True
- False

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Question 3

1 point possible (graded)

Consider a queue with two Poisson sources in the input: source 1 and source 2. The superposition of both Poisson sources also produces a Poisson traffic flow.

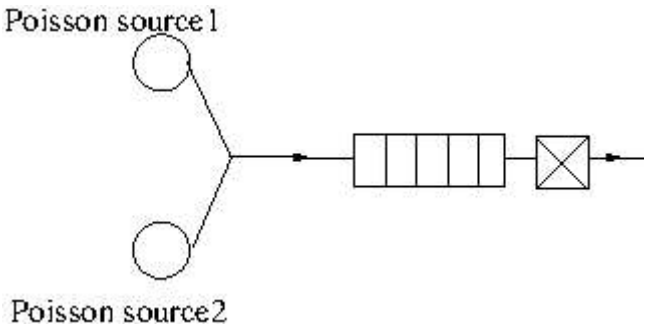

Figure 1. Question 3

The queue is finite with a single server and a FIFO discipline. The service times are exponentially distributed with rate μ. Sources 1 and 2 send packets at rates λ_1 and λ_2 respectively. We assume $\lambda_1 >> \lambda_2$.

The loss rate experienced by the clients of source 1 is larger than the loss rate experienced by the clients of source 2:

- True
- False

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Question 4

1 point possible (graded)

Consider the following state transition diagram.

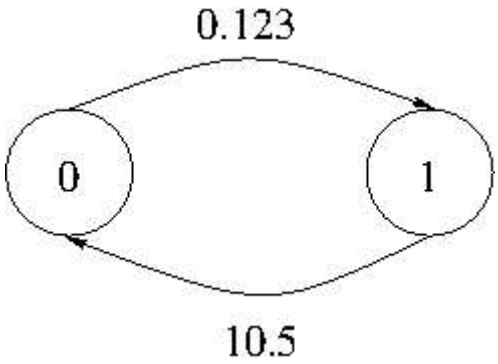

Figure 2. Question 4

Can it correspond to a continuous time Markov chain ?

- Yes
- No

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Question 5

1 point possible (graded)

Consider the following state transition diagram.

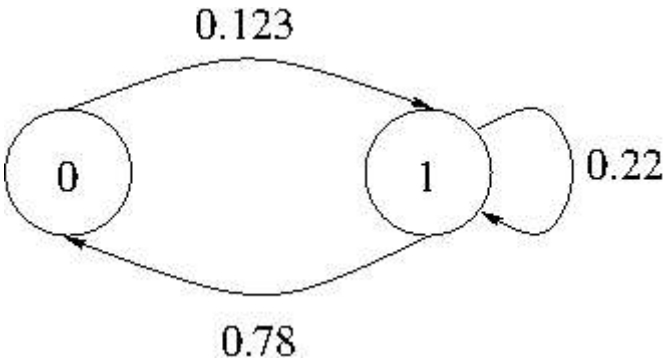

Figure 3. Question 5

Can it correspond to a continuous time Markov chain ?

- Yes
- No

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Question 6

3 points possible (graded)

Consider the following continuous time Markov chain (Figure 4).

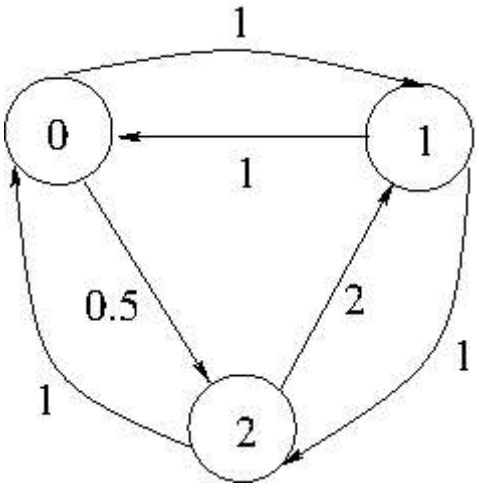

Figure 4. Question 6

Denote $Q = \{q_{ij}\}_{0 \leq i \leq 2, 0 \leq j \leq 2}$ its transition rate matrix. What are the values of:

q_{01} =

q_{11} =

q_{21} =

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Question 7

1 point possible (graded)

Consider the previous Markov chain (cf. Figure 4).

Solving the system $\Pi Q = 0$leads to a unique solution and this solution is the

steady-state probability vector:

- True
- False

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Question 8

0.0/3.0 points (graded)

Consider the previous Markov chain (cf. Figure 4). What is the stationary probability of state 1?

This probability is

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Question 9

1 point possible (graded)

Consider the previous Markov chain (cf. Figure 4). What is the percentage of time spent in state 1?

This percentage is

(in percent)

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Question 10

1 point possible (graded)

The Markov chain used to study the M/M/1 queue has a finite number of states.

- True
- False

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Question 11

1 point possible (graded)

Consider an M/M/1/K queue. If the load ρ increases by 10%, then the loss rate also increases by 10%.

- True

- False

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Question 12

1 point possible (graded)

Consider an M/M/1/K queue. If the load ρ is equal to 2, is it possible to fix K so that the loss rate is under 0.4?

- Yes
- No

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Question 13

1 point possible (graded)

Consider two M/M/1 queues. The first one receives on average 80 clients per time unit and has an average service time of 0.01 time units. The second one receives on average 800 clients per time unit and has an average service time of 0.001 time units.

The second queue has an average queue length larger than the first one:

- True
- False

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