Problem - Part 1

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In this case study, let us consider a company that sells a video-conferencing service. This company has deployed infrastructures that make it possible to support up to C=4 video-conferences simultaneously.

Some customers have subscribed to the video-conferencing service. These customers generate on average $\lambda = 1$ video-conference request per hour, and the average duration of a video-conference is $1/\mu = 1$hour.

Some statistical studies have shown that the requests are distributed according to a Poisson process, and that the duration of a video-conference is distribued as an exponential law.

Question 1

1 point possible (graded)

Which queuing system model can be used to characterize the number of ongoing video-conferences?

- M/M/1
- M/M/C/C
- M/M/C
- M/M/1/C

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Question 2

1 point possible (graded)

Let us denote by $\rho = \lambda/\mu$the offered load. Which formula gives the probability that a new video-conference call is blocked (because all the resources are busy)?

Select the correct answer(s).

- [ ] Erlang-B formula: $E_B(\rho, C)$
- [ ] Erlang-C formula: $E_C(\rho, C)$
- [ ] $(1-\rho)\rho^k$
- [ ] $\frac{\rho^C/C!}{\sum_{k=0}^{C} \rho^k/k!}$

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Question 3

1 point possible (graded)

Which figure corresponds to the state transition diagram of the number N(t) of ongoing video-conferences?

Figure 1

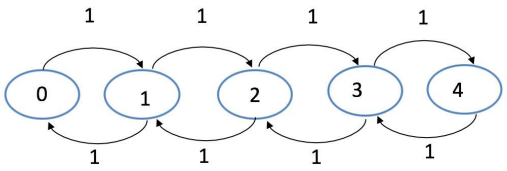


Figure 2

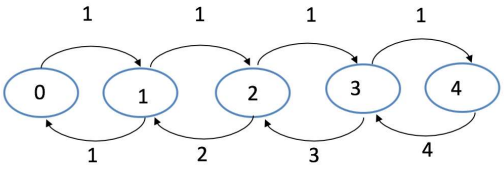
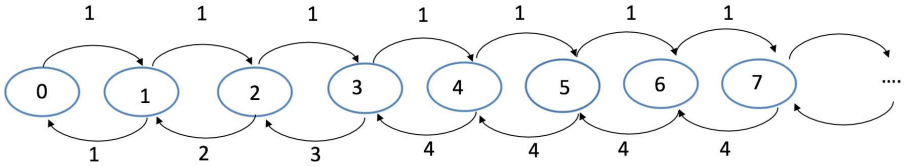


Figure 3



- Figure 1
- Figure 2
- Figure 3

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Question 4

1 point possible (graded)

Let $\pi_i = P(N(t) = i)$ be the steady-state distribution of N(t). Which of the following systems of equations are true?

Select the correct answer(s).

- $\pi_0 = \pi_1 = \pi_2 = \pi_3 = \pi_4$

- [ ] $\pi_1 = \pi_0, \pi_2 = \frac{1}{2}\pi_1, \pi_3 = \frac{1}{3}\pi_2, \pi_4 = \frac{1}{4}\pi_3$
- [ ] $\pi_1 = \pi_0, \pi_2 = \frac{1}{2}\pi_0, \pi_3 = \frac{1}{6}\pi_0, \pi_4 = \frac{1}{24}\pi_0$

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Question 5

3 points possible (graded)

Solve the normalization equation $\sum_{k=0}^{4} \pi_k = 1$. What is the value of π_0?

What is the value of π_4?

What is the value of the loss probability?

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Question 6

1 point possible (graded)

Which formula can be used to compute the average number of ongoing

Which formula can be used to compute the average number of ongoing video-conferences?

- $E(N(t)) = \pi_0 + \pi_1 + \pi_2 + \pi_3 + \pi_4$
- $E(N(t)) = \pi_1 + 2\pi_2 + 3\pi_3 + 4\pi_4$
- $E(N(t)) = \pi_1 + \frac{1}{2}\pi_2 + \frac{1}{3}\pi_3 + \frac{1}{4}\pi_4$

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Question 7

1 point possible (graded)

What is the value of the average number of ongoing video-conferences?

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