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ASSIGNMENT 01: MEASURING A QUEUEING SYSTEM — Queueing fundamentals

Problem 1. Instructions Show enough working for another student to reproduce your result. State any assumption that changes the model. Submit this source together with the PDF.

Problem 2. Warm-up: a stable queue A service desk receives requests at rate $\lambda = 18$ per hour and serves them at rate $\mu = 24$ per hour. For an $M/M/1$ model, calculate the utilisation ρ, the expected number in the system L, and the expected waiting time W.

For a stable queue $\boldsymbol{\lambda < \mu}$, so

$$\boldsymbol{\rho = \frac{\lambda}{\mu} = 0.75,} \qquad \boldsymbol{L = \frac{\rho}{1-\rho} = 3,} \qquad \boldsymbol{W = \frac{L}{\lambda} = \frac{1}{6}} \text{ hour } \boldsymbol{= 10} \text{ minutes}\boldsymbol{.}$$

Explain in your own words what the utilisation value says about spare capacity during the busiest part of the day.

⟶ *Answer*

Problem 3. Model critique The $M/M/1$ model assumes independent arrivals, exponentially distributed service times, one server and an unlimited waiting room. Pick two assumptions that are unlikely to hold for a real software service. For each, describe one measurement that would test the assumption and one design response if it fails.

(a) Assumption: _____
Measurement: _____
Response: _____

(b) Assumption: _____
Measurement: _____
Response: _____

Problem 4. Reflection What evidence would convince you that this queueing model is useful enough for capacity planning, even if it is not literally true?

Submitted by Student Name
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