Trabalho TP 547

-1 - Poisson

3 carros a cada 5 minutos

$1/\mu = 1$ min atendimento $\left(E[t_s] = \frac{1}{\mu}\right)$

a) MM1

$\lambda = \frac{3}{5}\ c/min \qquad E[t_s] = 1\ min$

$\rho = \lambda \cdot E[t_s] = \frac{3}{5} \cdot 1 = 0,6 \therefore \rho < 1$ sist. estável

$$E[t_q] = \frac{1}{\mu - \lambda} = \frac{1}{1 - 0,6} = 2,5\ min$$

b) $$E[w] = \frac{\rho^2}{1-\rho} = \frac{0,6^2}{1-0,6} = E[w] = 0,9\ carros$$

-2 a) $$E(t_w) = \frac{\rho^2}{\lambda(1-\rho)} = \frac{E[w]}{\lambda}$$

pct = 5000 bits

R = 500 Kbps

$\lambda = 40$ pct/s $\qquad E(t_q) = \frac{1}{\mu - \lambda}[E(t_s)] + E[t_w]$

$$E[t_s] = \frac{n}{R} = \frac{5000}{500.10^3} = 0,01$$

$\rho = \lambda E(t_s) = 40 \cdot 0,01 = 0,4$

$\rho < 1$ estável

$$E[t_w] = \frac{0,4^2}{40(1-0,4)} = 6,6666\ ms \cong 6,7\ ms$$

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b) $E[t_q] = E[t_w] + E[t_s]$

$= 6{,}667 \cdot 10^{-3} + 10 \cdot 10^{-3} \approx 16{,}6667$ ms

3) $\lambda = 200$ pct/s

M/M/1 $\lambda = 200$ pct/s

Cmed = 128 bytes

capa = 256 kbps

buffer {1, 5, 10, 15}

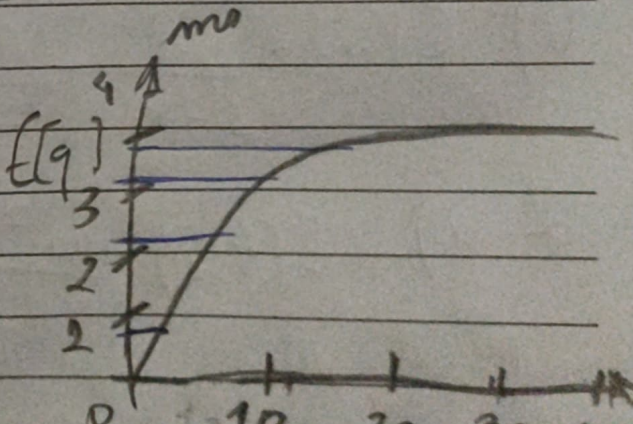
$E[t_s] = M/R = \frac{128 \cdot 8}{256 \cdot 10^3} = 0{,}004$

$\rho = \lambda \cdot E[t_s] = 200 \cdot 0{,}004 = 0{,}8$

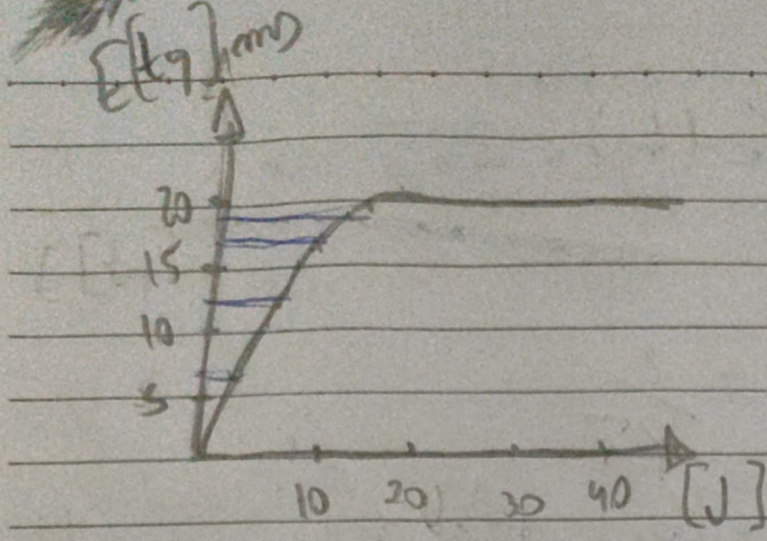
$\rho < 1$ estable

$$E[q] = \frac{\rho}{1-\rho} - \frac{(J+2)\rho^{J+2}}{1-\rho^{J+2}}$$

$$E[t_q] = \frac{E[q]}{\lambda(1-P_b)}$$



J = 1	J = 10
E[q] = 0,8525	E[q] = 3,1145
E[tq] = 5,778	E[tq] = 11,473
Pb = 0,2623	Pb = 0,0184
J = 5	**J = 15**
E[q] = 2,9434	E[q] = 3,6084
E[tq] = 11,473	E[tq] = 18,146
Pb = 0,0663	Pb = 0,0058

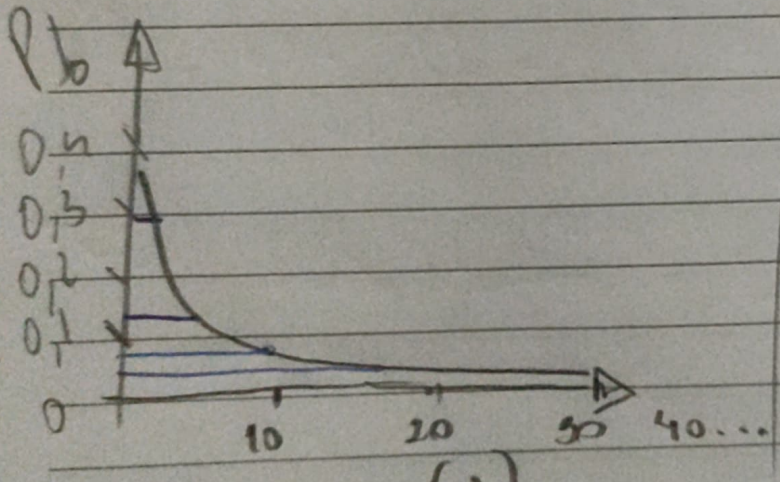


$J \to \infty$

$\therefore$ MM1

$$E[t_q] = \frac{1}{\mu - \lambda} = \frac{1}{250 - 200} = E[t_q] = 20\,ms$$

$$E[q] = E[t_q] \cdot \lambda = 20 \cdot 10^{-3} 200 = 4\ pacot$$



4) buffer ∞

Rimo

1 mm/s

tempo = 2000 bit/s

capacità 10 000 bps

M/G/1

$\Delta = 1$

a) E' costante $E[t_n]$ de $\therefore \sigma_{t_n}^2 = 0$ $E(t_n^2) = (E(t_n))^2 = \frac{1}{\mu^2}$

$\mu \cdot \frac{R}{m} = \frac{10\,000}{2 \cdot 10^3} = 5\ mm/s$ $E[t_n^2] = (E[t_n])^2$

$= 1/25$ $\rho = \Delta/\mu = 1/5 =$ $E[t_q] = E[t_w] + E[t_n]$

$\frac{\Delta \cdot E[t_n^2]}{2(1-\rho)} + \frac{1}{\mu}$

$= \frac{1 \cdot 1/25}{2(1-0,1)} + \frac{1}{5} \quad E(t_3) = 225\,ms$

b) $E[t_n^2] = 2/\mu^2 = 2/25$

$E(t_3) = E(t_w) + E(t_0) = \frac{\lambda \cdot E(t_0)^2}{2(1-\rho)} + \frac{1}{\mu}$

$\frac{1 \cdot 2/25}{2(1-0,2)} + \frac{1}{5} = 250\,ms$