作业 1

5.

(a) 每个收费站之间相距 150/2=75(km)

每个收费站的传输时延=10*12 = 120(s)=2min

收费站之间的传播时延=75/100=0.75(h)=45min

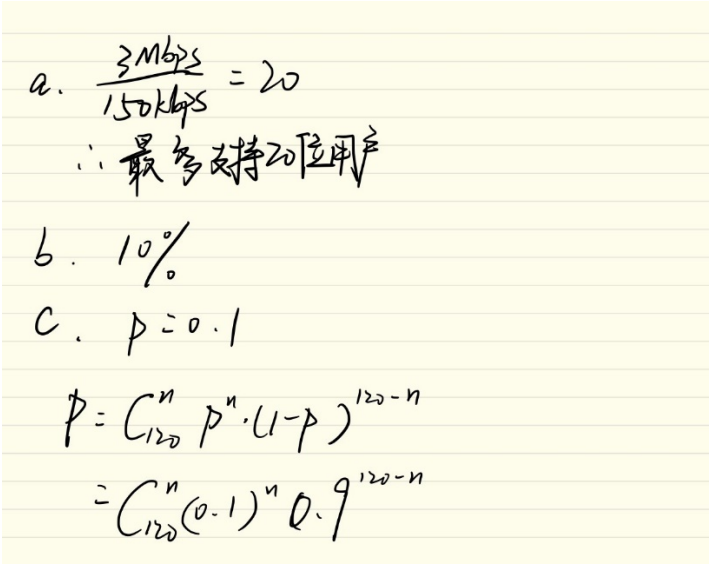
所以，车队通过三个收费站所需时间 t=2*3+45*2=6+90=96(min)

(b) 传播时延同(a),

传输时延=8*12=96(s)=1.6min

所以，总时长 t=1.6*3+45*2 = 94.8(min)

8.



d.

则

同时有21或大于21位用户正在传输的概率：

$$P = 1 - P\left(\sum_{i=1}^{120} X_i < 21\right)$$

$$= 1 - P\left(\frac{\sum_{i=1}^{120} X_i - 12}{\sqrt{120 \times 0.1 \times 0.9}} \le \frac{21-12}{\sqrt{120 \times 0.1 \times 0.9}}\right)$$

$$= 1 - P\left(\frac{\sum_{i=1}^{120} X_i - 12}{3.286} \le \frac{9}{3.286}\right)$$

$$= P(Z \le 2.74)$$

$$= 1 - 0.997 = 0.003$$

∴实际有多于或等于21位用户在传输的概率为0.3%.

10.

10. $d_{端} = d_{prop} \times 2 + \left(\frac{L}{R_1} + \frac{L}{R_2} + \frac{L}{R_3}\right) + \left(\frac{d_1}{S_1} + \frac{d_2}{S_2} + \frac{d_3}{S_3}\right)$

当 $L = 1500byte = 12000bit$.

$$d_{端} = 3ms \times 2 + \left(\frac{12000}{2000} \times 3\right)ms + \left(\frac{5000 \times 10^3}{2.5 \times 10^8} + \frac{4000 \times 10^3}{2.5 \times 10^8} + \frac{1000 \times 10^3}{2.5 \times 10^8}\right) \times 10^3 ms$$

$$= 6 + 6 \times 3 + (20 + 16 + 4)$$

$$= 64(ms)$$