

## Exame 2020/2021 (Época Normal)

1. Pergunta 1
  - a. A connectionless reliable service.
2. Pergunta 2
  - d. 200 kbits/s
3. Pergunta 3
  - c.  $FER_a > FER_b$
4. Pergunta 4
  - b.  $II(1).SW$
5. Pergunta 5
  - e.  $\lambda$
6. Pergunta 6
  - d.  $TDM > Slotted Aloha > Aloha$
7. Pergunta 7
  - b. MAC address of RT.port0
8. Pergunta 8
  - b. forwarded to port 3
9. Pergunta 9
  - d. 6 ms
10. Pergunta 10
  - a. information about all the nodes

### 11. Pergunta 11

$$R = 600kbits/s = 600000bits/s$$

$$T_p = 40ms = 0.04s$$

$$L = 300bytes = 2400bits$$

$$BER = 0.0001$$

$$P_e = 1 - (1 - BER)^L = 1 - (1 - 0.0001)^{2400} = 0.213382$$

$$T_f = \frac{L}{R} = \frac{2400}{600000} = 0.004$$

$$a = \frac{T_p}{T_f} = \frac{0.04}{0.004} = 10$$

$$S = \frac{1-P_e}{1+2a \cdot P_e} = \frac{1-0.213382}{1+2 \cdot 10 \cdot 0.213382} = 0.14933 \approx 15\%$$

### 12. Pergunta 12

$$S = \frac{W \cdot (1-P_e)}{1+2a} = \frac{16 \cdot (1-0.213382)}{1+2 \cdot 10} = 0.6$$

$$R_{max} = S \cdot R = 0.6 \cdot 600 = 360kbits/s$$

### 13. Pergunta 13

$$BER = 0$$

$$S = \frac{W}{1+2a} \iff 1 = \frac{16}{1+2 \frac{40 \cdot 10^{-3}}{\frac{L}{600000}}} \iff 15L = 80 \cdot 10^3 \cdot 6 \cdot 10^5 \iff L = 3200bits = 400bytes$$

14. Pergunta 14

$$\rho = 0.8$$

$$C = 100 \text{ Mbits/s} = 10^8 \text{ bits/s}$$

$$L = 10^4 \text{ bits}$$

$$\mu = \frac{C}{L} = \frac{10^8}{10^4} = 10000$$

$$\lambda = \rho \cdot \mu = 0.8 \cdot 10000 = 8000$$

$$\lambda_{port} = \frac{\lambda}{N_{ports}} = \frac{8000}{10} = 800$$

15. Pergunta 15

$$B = 4 \text{ (number of buffers)}$$

$$P(B) = \frac{(1-\rho)\rho^B}{1-\rho^{B+1}} = \frac{(1-0.8) \cdot 0.8^4}{1-0.8^5} = 0.121847$$

$$P(\bar{B}) = 1 - P(B) = 1 - 0.121847 \approx 88\%$$

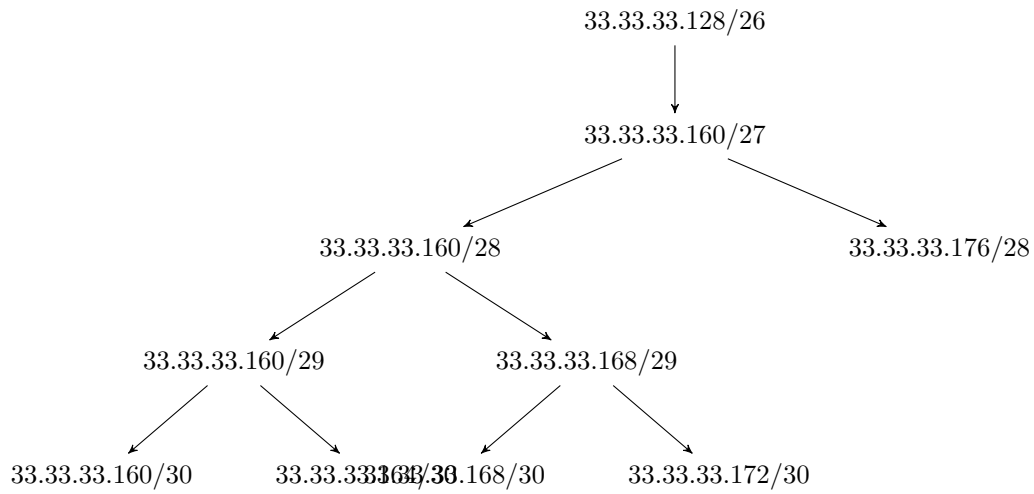
16. Pergunta 16

$$N = \frac{\rho}{1-\rho} = \frac{0.8}{0.2} = 4$$

$$N' = N - 1 = 3$$

$$T_w = N' \cdot T_s = 3 \cdot \frac{1}{\mu} = \frac{3}{10000} = 0.0003 \text{ s} = 300 \mu\text{s}$$

17. Pergunta 17



33.33.33.176/28

18. Pergunta 18

33.33.33.159

19. Pergunta 19

33.33.33.173

20. Pergunta 20

a. R4