Universidade de Aveiro
Licenciatura em Engenharia de Computadores e Informática
Exame Final de Redes de Comunicações 1 – 11 de Fevereiro de 2022

Duration: 2:00 hours. With no extra reading. Carefully justify your answers.

Consider that you were hired to be the network manager of a company network. The characteristics of the network are the following:

- The company network has 2 sub-networks with private addressing, and a connection to the outside through R1, with the connection to the Internet emulated by R2;
- In each switch port and in each router interface there is an identifier;
- In each terminal or network interface there is an IP address;
- R1 has a DHCP server to allocate addresses inside the company network;
- R1 has a default route to the internet and has NAT/PAT correctly configured;
- R2 has a route for the company network through R1.

1. PC1 and PC2 cannot communicate. What can be the reason? In this situation, and considering initially ARP and switching tables empty, is it possible that *switch* 1 learns the port associated to each PC 1 and 2? Justify. (2.0 points)

2. Considering that the problem of the previous question is correctly solved, propose, justifying, addresses for the interfaces of R1 (values x and y) to provide communication between PC1 and PC3. (1.5 points)

3. Considering the communication in the previous question 2, which are the entries in the switching table of *switch* 1? (1.5 points)

4. In an available interface of *switch* 2 we connect an access point of a wireless network. However, while the users connect to the network, the performance of the network decreases (large transmission delays). Explain a possible reason for this observation, and also a possible solution to solve it. (2.0 points)

5. The leasing time of the DHCP has a time specified by the network manager. How would you adjust this time in the case you have many users moving, entering and leaving the network? Justify. (1.5 points)

6. Considering NAT/PAT in R1 for the communication of PC1, 2 and 3 with the outside (and considering the problem in question 1 solved), can the private addresses be dynamically allocated through DHCP? Present an example of a transition table with a NAT pool of 200.0.0.128/25. (1.5 points)

7. Considering that in IPv6 you may have many more addresses than in IPv4, explain how a terminal can acquire its own address and communicate with the Internet. (2.0 points)

8. It is detected a problem in the TCP configuration, that makes the transmission rate to be very low. It was discovered that the problem is related to the low timeout value when detecting lost packets. Justify why a small timeout can lead to a small transmission rate. (1.5 points)

9. Even after all configurations are correct, the TCP transmission rate cannot exceed 60% of the links capacity. Considering that there are also services running through UDP in the same links, can you understand what may be avoiding TCP to have a higher rate? Justify. (2.0 points)

10. Considering that you want to contact a server that is near your network, would you prefer a DNS with an iterative or recursive resolution? Justify. (1.5 points)

11. Is it possible in PC4, running an HTTP server, to have simultaneous sessions with PCs 1 and 2? Justify with a proposal of a solution. (1.5 points)

12. In which cases can TFTP have a performance similar to the one of FTP? Justify (1.5 points)