University of Aveiro
Licenciatura em Engenharia Informática

Exam of Networks and Services – January 18th, 2023

Duration: 2h. Carefully justify all your answers.

1. Regarding the network in annex, consider that: (i) all connections between layer 2 switches (layer 2-layer 2) and between layer 2 and layer 3 switches (layer 2-layer 3) are inter-switch/trunk ports, (ii) all connections between layer 3 switches are layer 3 (routing); (iii) the Spanning Tree Protocol (STP) is active in all switches/bridges. In both L3 switches the switching module corresponds to ports f1/0-15. Consider that VLANs 1, 2, and 3 are configured in all layer 2 and layer 3 switches.

a) For the Spanning-tree process of VLAN 1 (SW1 to SW5, SWL3A and SWL3B), identify and justify which is the root switch/bridge, which is the root path cost of each switch/bridge and which are the root ports, the designated ports and the blocked ports at each switch/bridge. Justify your answer. (3.5 points)
   Note: the STP priority and the MAC address are indicated next to the corresponding switch/bridge, while the STP cost of all ports is located between parenthesis next to the corresponding port.

b) Do you consider that the spanning tree topology is already efficient or would you make any changes in order to increase its efficiency? Justify your answer. (1.5 points)

c) Considering that the IPv6 neighboring tables are empty, specify which packets are exchanged (and their sequence) when you execute the IPv6 ping command from PCA to PCB (assume that the PCA *default gateway* is the corresponding interface of SWL3 A and the PCB *default gateway* is the corresponding interface of SWL3 B). (1.5 points)

2. Consider that this company has the range of public IPv4 addresses 193.132.132.128/25, will use the range of private IPv4 addresses 10.10.0.0/16 and the range of IPv6 addresses 2330:30:30::/60.

a) Define public and/or private IPv4 sub-networks (network identifier and subnet mask) for all LANs and VLANs assuming that there are some services running at terminals/servers that need public IPv4 addresses, namely: VLAN 2 has a maximum of 15 terminals that need public addresses; VLAN 3 has a maximum of 8 terminals that need public addresses; DMZ has a maximum of 6 terminals that need public addresses; Datacenter needs 8 public addresses; the NAT/PAT mechanism needs 4 public addresses. (3.5 points)

b) Suppose that the company has a functional DNS server and an email server running on a machine with IPv4 address 193.132.132.133 and IPv6 address 2330:30:30::110/64. Which records to you have to add to the DNS server configuration in order to include the email server to the **name→IPv4/IPv6 address** translation service**?** (2.0 valores)

3. Consider that Routers 1 and 2 and Switches L3 SWL3A and SWL3B are configured with the routing protocols RIPng and OSPFv2. Consider that all OSPF costs are depicted in parenthesis next to the interface and the RIP costs are all equal to 1. Also assume that Router 1 is announcing an OSPF default route of the E2 type with metric 10 and a RIPng default route with metric 5. Besides, Router 2 is redistributing the static route to the IPv4 network of the company Site B.

a) Which are the IPv4 routing table entries of SWL3A corresponding to DMZ, site B and Internet? Note: Identify the networks, IP addresses and interface names by and explicit alphanumeric identifier (ex: netIPv4VLAN1, addIPv4eth0Router1, intEth0Router1). (2 points)

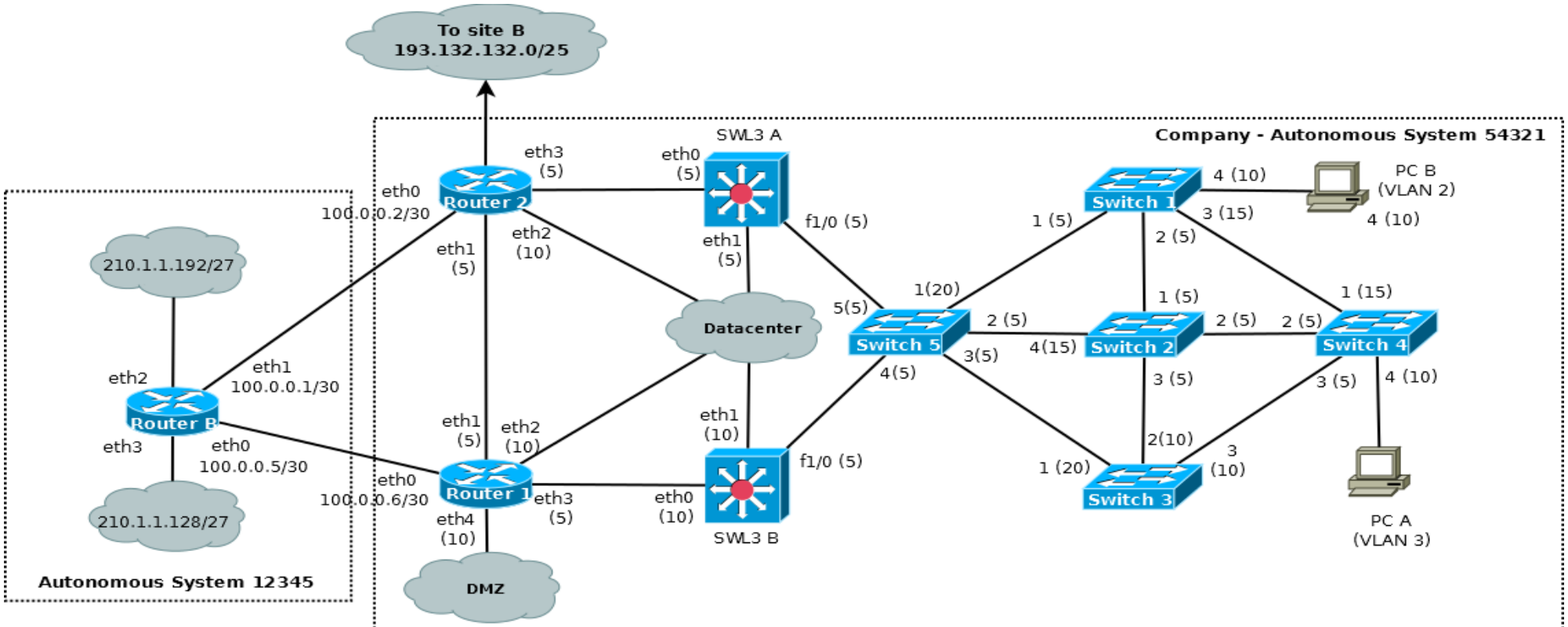
b) Which are the IPv6 routing table entries of SWL3B corresponding to DMZ, Datacenter and Internet? Note: Identify the networks, IP addresses and interface names by and explicit alphanumeric identifier (ex: netIPv4VLAN1, addIPv4eth0Router1, intEth0Router1). (1.5 points)

c) We want that any IPv4 packet coming the layer 2 switches network and destined to the DMZ must be preferentially routed through Router 2. Which configurations do you need to change in order to fulfill this requirement? (1.5 points)

4. Consider that the BGP protocol is configured between Router 1 and Router A and between Router 2 and Router A. Assume also that Router A is aggregating the internal networks of AS 12345.

a) Which is (are) the BGP entry(ies) of the Router 1 routing table? (1.5 valores)

b) If at AS 54321 we want to receive external traffic (coming from AS 12345) preferentially through Router2, which configurations do we need to include? (1.5 valores)



SWL3 A
Priority: 7999h
MAC Address: AA:1A:1A:1A:1A:1A
VLAN Interfaces (OSPF cost 5)

SWL3 B
Priority: 7000h
MAC Address: BB:1B:1B:1B:1B:1B
VLAN Interfaces (OSPF cost 5)

SW1
Priority: 6999h
MAC Address: CC:24:24:24:24:24

SW2
Priority: 7000h
MAC Address: CC:22:22:22:22:22

SW3
Priority: 7000h
MAC Address: 00:23:23:23:23:23

SW4
Priority: 6998h
MAC Address: 00:33:33:33:33:33

SW5
Priority: 6998h
MAC Address: 00:11:11:11:11:11