Primer control de Xarxes de Computadors (XC), Grau en Enginyeria Informàtica	29/10/18	Tardor 2018
NOM (en MAJÚSCULES):	COGNOMS (en MAJÚSCULES):	GRUP:	DNI:

Duració: 1h 30 minuts. El test es recollirà en 25 minuts.

Test. 4 points. Questions can be
- Single answer (RU). 0.4 points for a RU correct answer.
- Multiple answers (MR). 0.4 points for an entire MR correct answer, half points if only one mistake, 0 points for other cases. The number of correct answers could be from one to all, i.e. at least one is always correct.

1. **RU**. For TCP/IP model, the correct level order from the bottom is

☐ Physical layer, Data link, Network, Transport, Session, Presentation, Application

☐ Network card, Network, Internet, Application

☐ Network interface, Data link, Networks, Transport, Application

☐ Physical layer, Network, Transport, Application

☐ Physical network interface, Network, Transport, Network application

2. **MR**. Considering the 128.0.0.128/25 range, we can create

☐ 4 networks with 25 hosts each

☐ 6 networks, 2 with 20 hosts, 3 with 10 hosts and 1 with 5 hosts

☐ 8 networks with 16 hosts each

☐ 2 networks, 1 with 64 hosts and the other with 40 hosts

☐ 16 networks with 4 hosts each

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3. **RU**. Consider the network in the figure, assume that all ARP tables are empty and all devices are correctly configured. Determine the number of **ARP requests** required to transmit a datagram from PC1 to PC2 and receive an answer from PC2 to PC1.

☐ 1
☐ 2
☐ 3
☐ 4
☐ 5
☐ 6
☐ 7

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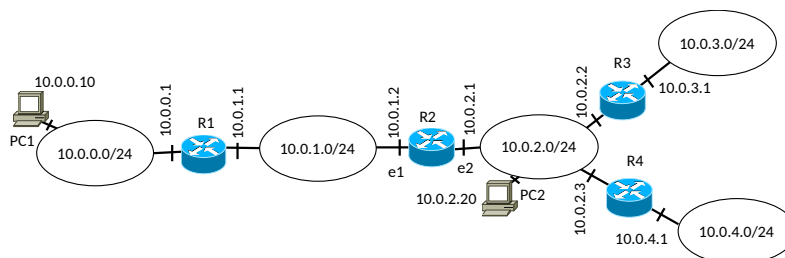
4. **RU**. Assume that RIPv2 is active in the network in the figure above. Determine the RIPv2 message that R1 sends to R2 every 30 seconds

☐ 10.0.0.0/24 metric 1, 10.0.1.0/24 metric 1, 10.0.2.0/24 metric 2, 10.0.3.0/24 metric 3, 10.0.4.0/24 metric 3

☐ 10.0.2.0/24 metric 2, 10.0.3.0/24 metric 3, 10.0.4.0/24 metric 3

☐ 10.0.0.0/24 metric 1

☐ 10.0.0.0/24 metric 1, 10.0.1.0/24 metric 1

5. **RU**. If the interface e1 of router R2 of the figure above fails, determine the RIPv2 message that R2 sends to 10.0.2.0/24

☐ to R3: 10.0.1.0/24 metric 16, 10.0.1.0/24 metric 16 and 10.0.4.0/24 metric 2
   to R4: 10.0.1.0/24 metric 16, 10.0.1.0/24 metric 16 and 10.0.3.0/24 metric 2

☐ 10.0.1.0/24 metric 16 y 10.0.0.0/24 metric 2

☐ 10.0.1.0/24 metric 16

☐ 10.0.0.0/24 metric 16 and 10.0.1.0/24 metric 16

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6. **MR**. Determine the correct answer or answers

☐ A gratuitous ARP message is used to verify the connectivity between 2 hosts

☐ If a router discards a datagram and sends an ICMP message, this message is sent to the source @IP of the discarded datagram

☐ The TTL field in the IP header is used to fragment datagrams too large to be encapsulated in a frame

☐ If NAT is not used, 2 hosts connected to Internet cannot have the same public @IP

7. **RU**. The @IP 225.5.5.5 belongs to

☐ A class
☐ B class
☐ C class
☐ Private range
☐ D class
☐ E class

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8. **MR**. If a router with the routing table on the right-hand side receives a datagram with destination:

☐ 10.0.0.200, the datagram is sent to e0

☐ 200.0.2.10, the datagram is sent to e2

☐ 10.10.3.1, the datagram is sent to e0

☐ 10.0.3.10, the datagram is sent to e1

☐ 10.0.1.130, the datagram is sent to e1

Network	Mask	Gateway	Interface
10.0.0.0	24	-	e0
10.0.1.0	25	-	e1
10.0.2.0	24	-	e2
10.0.0.0	8	10.0.0.1	e0
0.0.0.0	0	10.0.2.1	e2
10.0.3.10	32	10.0.1.1	e1

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9. **RU**. The NAT with ports (PAT or NAT overload) is used to

☐ Translate a private port to a public one

☐ Allow a public client to access to a private server

☐ Allow a group of private clients to communicate to a public server

☐ Provide to a group of private clients, a unique and different public @IP for each one in Internet

10. **RU**. Determine the protocol that can assign a default route to a host

☐ DNS
☐ TCP
☐ DHCP
☐ RIP
☐ NAT
☐ ACL

Time: 1hour and 30 minutes. The quiz will be collected in 25 minutes.

Problem 1 (4 points)

The local area network (LAN) in the figure uses public IP addresses and may include 220 hosts. D is the local DNS server, the router R is the DHCP server, H and K are hosts. The network domain is *domini.tld* (that is, the name of host H is h.domini.tld). All devices are configured correctly and are active, except host H which is initially turned off.

As notation, we will use capital letter for IP addresses and small letters for MAC (Ethernet) addresses.

a) (0.75 points) Complete the sequence of Ethernet frames and IP packets transmitted through the network (LAN) when H is turned on and get its configuration.

Ethernet		IP		
src	dst	src	dst	payload
h				

Once the configuration is completed host H knows its IP address (H), the DNS server's IP address (D) and that of the default router (R).

b) (1.25 points) Complete the sequence of frames and packets when from H the command "*ping k.domini.tld*" is executed.

Ethernet		ARP		IP		
src	dst	Q/R	message	src	dst	Payload
h						

A private network is added to the initial configuration as shown in the figure. The figure includes the router's interfaces and their corresponding IP addresses.
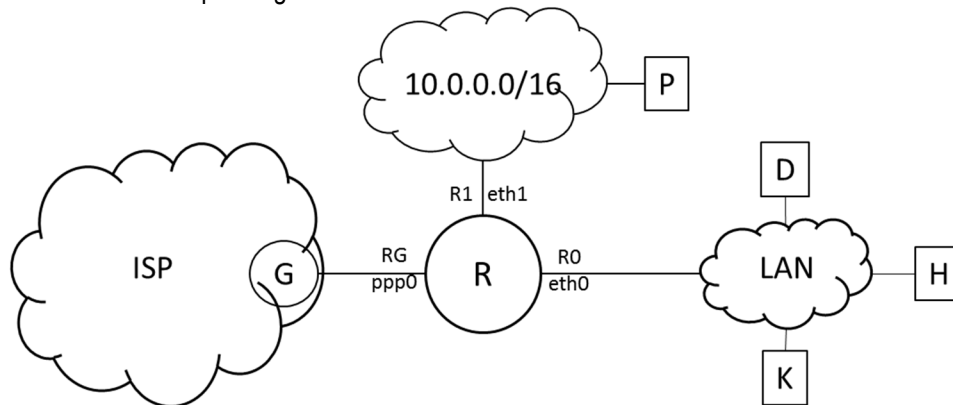
The routing table for router R is the following:

Destination	Gateway	interface
LAN	----	eth0
10.0.0.0/16	----	eth1
G/32 (ISP)	----	ppp0
0.0.0.0/0	G	ppp0

c) (1 point) From host P (in the private network) the command "*ping www.upc.edu*" is executed (the web server's IP address is U). Complete the sequence of <u>datagrams</u> that go through R stating the corresponding in and out interfaces. Note that R performs.

Interface	In/Out	Src IP address	Dst IP address	payload
eth1	in	P	D	DNS request
eth0	out			
eth0	in			
eth1	out			

d) (1 point) To provide access form home a tunnel is configured between the home router (HR) and R (interface RG). The private network configured at home is 10.10.10.0/24.
Complete the entries that <u>will be added</u> to the routing table of router R:

Destination	Gateway	interface
192.168.0.0/30		tun0
10.10.10.0/24		

When H executes the command "*ping 10.10.10.10*", complete the sequence of datagrams that go through router R.

Interface	In/Out	Src IP address	Dst IP address	payload
eth0	in	H	10.10.10.10	ICMP echo request
ppp0	out			

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Exercise 2 (2 points)

Router R in the figure includes a Firewall in its Internet-side interface. Consider the subset of an Access Control List (ACL) in the following table. Take into account that port 53 corresponds to the DNS service and port 80 to HTTP (web).

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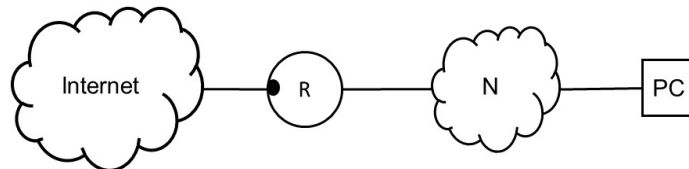
	IN/OUT	IP src	port src	IP dst	port dst	Protocol	Action
1	IN	ANY		N		ICMP	ACCEPT
2	IN	D1	53	N	>1023	UDP/TCP	ACCEPT
3	OUT	N	>1023	D1	53	UDP/TCP	ACCEPT
4	IN	ANY	>1023	N	80	TCP	ACCEPT
5	OUT	N	80	ANY	>1023	TCP	ACCEPT
6	ANY	ANY	ANY	ANY	ANY	ANY	DENY

a) *(0.5 points)* Indicate (in the provided table) the sequence of packets that go through the Firewall when a HTTP client, external to N, connects to a HTTP server in N (requesting a web page that is returned). The arrows indicate the direction of the transmission: ← towards Internet, → towards the internal network N.

← / →	Application	Number of ACL rule used	Action

b) *(0.5 points)* Indicate (as in question a) the sequence of packets that go through the Firewall when a query is made (from which there is an answer) from PC to a DNS server D2 external to N.

← / →	Application	Number of ACL rule used	Action

c) *(0.5 points)* If we want ICMP messages to be exchanged between PC and a machine on the Internet, do we have to add rules to the ACL?   YES   NO

If so, indicate which one(s). Otherwise, indicate what rules already allow it.

Rules		IN/OUT	IP src	port src	IP dst	port dst	Protocol	Action

d) *(0.5 points)* If we want PC to access an HTTP server external to N, do we have to add rules to the ACL?
          YES   NO

If so, indicate which one(s). Otherwise, indicate what rules already allow it.

Rules		IN/OUT	IP src	port src	IP dst	port dst	Protocol	Action