UCLM
UNIVERSIDAD DE CASTILLA-LA MANCHA

Computer Networks II

Course 18/19 :: Test 2

Escuela Superior de Informática

score

This exam has 24 questions with a value of 40 points. Three wrong answers substract a point. Only an answer is correct if otherwise not stated. Calculator use is forbidden. The maximum duration of this exam is 90 minutes.

Regarding the ANSWER SHEET:

- *Fill in your personal data in the form above.*
- *Enter* Computer Networks II *in the field EVALUATION.*
- *Indicate your ID in the side box (also marking the corresponding cells).*
- *Check the box «**2**» in the TYPE OF EXAMINATION box.*

Check your answers only when you are completely sure. The scanner does not support corrections or deletions of any kind. It will automatically cancel them. You must only deliver the answer sheet.

Surname: _____ Firstname: _____ Group: _____

1 [1p] What is the goal of the dynamic routing protocols?

- ☐ **a)** Recalculate the routing tables of the routers as subnet conditions change.
- ☐ **b)** Coordinate routers to avoid congestion.
- ☐ **c)** Generate topology maps for the ISP network management tools.
- ☐ **d)** To get latency, delay and performance measures of the subnet.

2 [1p] In the link state algorithm each router creates a packet of information called LSP (Link State Packet) that is disseminated:

- ☐ **a)** To all your neighbor routers.
- ☐ **b)** Only the routers up towards the root of the optimal routes tree.
- ☐ **c)** To all routers in the network, by flooding.
- ☐ **d)** Only the routers down in the optimal routes tree.

3 [1p] Why the only possible metric for a distance vector algorithm is the number of hops?

- ☐ **a)** Routers only have static information.
- ☐ **b)** Distance vector does not require any metric.
- ☐ **c)** The protocol only accepts an integer as a metric value.
- ☐ **d)** Any metric offering comparable values can be used.

4 [1p] Choose the **false** option with respect to RIP:

- ☐ **a)** It's a layer 3 protocol
- ☐ **b)** RIP means *Routing Information Protocol*.
- ☐ **c)** Uses a link status algorithm.
- ☐ **d)** It was used massively in the early years of the Internet.

5 [1p] In a distance vector protocol, what happens to routers whose cost is greater than the value defined for infinity?

- ☐ **a)** They are considered inaccessible.
- ☐ **b)** The packets directed at them are discarded.
- ☐ **c)** The packets directed at them are sent to the default router.
- ☐ **d)** A value for infinity cannot be defined in distance vector protocol.

6 [1p] Which of the following commands would you use to configure port forwarding?

- ☐ **a)** `ip nat inside source static tcp 161.67.100.1 80 192.168.0.12 80`
- ☐ **b)** `iptables -t nat -A POSTROUTING -o eth0 -j MASQUERADE`
- ☐ **c)** `ip nat inside source static tcp 192.168.0.12 80 161.67.100.1 80`
- ☐ **d)** `ip nat inside source list 1 interface Gi0/0 overload`

7 [1p] Two hosts A=10.10.0.1 and B=10.10.0.2 access to Internet through a organization's NAT border router, with IP=162.168.15.23. It is known that A and B simultaneously access web server at 121.15.10.21. Select the correct answer:

- ☐ **a)** The router must run NAT to ensure that there is no ambiguity in the translations.
- ☐ **b)** The router must run NAPT to ensure that there is no ambiguity in the translations.
- ☐ **c)** The router must run NAPT with port forwarding
- ☐ **d)** In that scenario there can never be conflicts in the translation.

8 [1p] Which protocol is encapsulated in PPTP ?

☐ **a)** PPP over IP ☐ **b)** IP over PPP ☐ **c)** GRE over PPP ☐ **d)** PPP over GRE

9 [1p] What is a RADIUS server used for?

- ☐ **a)** Create a tunnel to implement a private network over the public IP network.
- ☐ **b)** Enable aggregation of multi-link PPP channels.
- ☐ **c)** Manage the start and end of the logical session in the PPTP protocol.
- ☐ **d)** Provide an authentication, authorization and accounting mechanism for users accessing resources.

10 [1p] What is the difference between an intranet and an extranet?

- ☐ **a)** An intranet is a private network and an extranet is a public network.
- ☐ **b)** An intranet is an isolated network while an extranet is an intranet with external access.
- ☐ **c)** An intranet must use private addresses while an extranet must use public addresses.
- ☐ **d)** In an intranet, data is encrypted while in an extranet data is transmitted unencrypted.

11 [1p] Mark the statement **false** in relation to the IPv6 protocol:

- ☐ **a)** Is a layer 3 protocol except when used in tunnel mode where it is transport protocol.
- ☐ **b)** It's an inter-network protocol.
- ☐ **c)** Use a hierarchical addressing system.
- ☐ **d)** Is a *plug and play* protocol.

12 [1p] Indicate which of the following IPv6 addresses is not correctly represented:

☐ **a)** ::128 ☐ **c)** 0:0:0:0:0:FFFF:129.144.52.38
☐ **b)** FEDC:BA98:7654:3210:FEDC:BA98:7654:3210 ☐ **d)** FEDC:BA98:7654::FEDC:BA98::3210

13 [1p] Why in IPv6 there are no *broadcast* addresses?

- ☐ **a)** There are too many addresses to be able to refer to all.
- ☐ **b)** The broadcast addresses would be too long and therefore inefficient.
- ☐ **c)** They are not necessary because a group address can be used.
- ☐ **d)** Yes, there are broadcast addresses. They are those ending in :FFFF

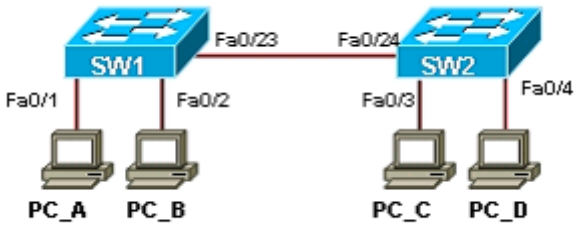
14 [1p] Why are the local IPv6 addresses said to be *plug-and-play?*

- ☐ **a)** Because DHCP assigns them when the network cable is connected.
- ☐ **b)** Because the computer can communicate on its own by self-assigning an address.
- ☐ **c)** Because it can use random physical addresses.
- ☐ **d)** Is a commercial term with no technical meaning.

15 [1p] What is the IPv6 *neighbor discovery* concept related to?

- ☐ **a)** With dynamic routing protocols.
- ☐ **b)** With path minimum MTU discovery.
- ☐ **c)** With the correspondence between physical and logical addresses.
- ☐ **d)** IPv6 doesn't handle that concept.

16 [1p] In the following figure, how do you forward a frame from PC-A to PC-C if the table of SW1 MAC addresses is empty?



- ☐ **a)** SW1 floods all its ports with the frame, with the exception of the port connected to the switch SW2 and the port from that frame comes.
- ☐ **b)** SW1 floods all its ports with the frame, with the exception of the port for which it was received.
- ☐ **c)** SW1 uses a discovery protocol to synchronize MAC tables of both switches and then sends the frame to all hosts connected to SW2.
- ☐ **d)** SW1 discards the frame because it does not know the destination MAC address.

17 [1p] What is the main reason why bridges and switches forget the directions they learn after a period of inactivity?

- ☐ **a)** Because his memory is limited.
- ☐ **b)** Because they use volatile RAM.
- ☐ **c)** To allow computers to connect to another interface.
- ☐ **d)** Bridges forget addresses, but switches never do.

18 [1p] Why do switches discard *broadcast* frames?

- ☐ **a)** Because they are too big.
- ☐ **b)** To improve efficiency by avoiding unnecessary messages.
- ☐ **c)** Because the broadcast address can never be included in the MAC table.
- ☐ **d)** Switches do not discard *broadcast* frames.

19 [1p] In what situation can Ethernet use the flow control feature?

- ☐ **a)** It always use it.
- ☐ **b)** There is no flow control mechanism on Ethernet.
- ☐ **c)** It can only be used in full-duplex links if both peers negotiate it.
- ☐ **d)** May only be used if the switch temporarily store frames of all link devices.

20 [1p] The *cut-through* switching technique retransmits the frame as soon as it receives its first 6 bytes. What is the main reason?

- ☐ **a)** Reduces latency.
- ☐ **b)** Reduces the amount of memory required in the switch.
- ☐ **c)** Avoids the need to maintain a table of MAC addresses.
- ☐ **d)** That is not the way that *cut-through* works.

E. [5p] An organization owns the address block 116.20.0.0/16. The organization wants to make a distribution of the address block to address the 4 company networks A, B, C, and D.

The network configuration is as follows:

- A: 1000 hosts.
- B: 500 hosts.
- C and D: 200 hosts each.

Routers R1 and R2 are used with three entries each: R1 connects A, B and R2; and R2 connects to C, D and R1. Distribution should minimize address wastage. Answer the following questions:

> **21** (1p) Address blocks (First Addr - Last Addr) that will be assigned to the 4 subnets after applying **subnetting**.

a)
```
A = 116.20.0.0 - 116.20.63.255
B = 116.20.64.0 - 116.20.127.255
C = 116.20.128.0 - 116.20.191.255
D = 116.20.192.0 - 116.20.255.255
```

c)
```
A = 116.20.0.0 - 116.20.255.255
B = 116.21.0.0 - 116.21.255.255
C = 116.22.0.0 - 116.22.255.255
D = 116.20.192.0 - 116.20.255.255
```

b)
```
A = 116.20.0.0 - 116.20.61.255
B = 116.20.62.0 - 116.20.125.255
C = 116.20.126.0 - 116.20.189.255
D = 116.20.190.0 - 116.20.255.255
```

d)
```
A = 116.20.0.0 - 116.20.63.255
B = 116.20.62.0 - 116.20.127.255
C = 116.20.120.0 - 116.20.191.255
D = 116.20.188.0 - 116.20.255.255
```

☐ **a)** ☐ **b)** ☐ **c)** ☐ **d)**

> **22** (2p) Address blocks (First Addr - Last Addr) that will be assigned to the 4 subnets after applying **VLSM**.

a)
```
A = 116.20.0.0 - 116.20.7.255
B = 116.20.8.0 - 116.20.15.255
C = 116.20.16.0 - 116.20.19.255
D = 116.20.20.0 - 116.20.23.255
```

c)
```
A = 116.20.0.0 - 116.20.31.255
B = 116.20.32.0 - 116.20.47.255
C = 116.20.48.0 - 116.20.51.255
D = 116.20.52.0 - 116.20.55.255
```

b)
```
A = 116.20.0.0 - 116.20.15.255
B = 116.20.16.0 - 116.20.23.255
C = 116.20.24.0 - 116.20.27.255
D = 116.20.28.0 - 116.20.31.255
```

d)
```
A = 116.20.0.0 - 116.20.3.255
B = 116.20.4.0 - 116.20.5.255
C = 116.20.6.0 - 116.20.6.255
D = 116.20.7.0 - 116.20.7.255
```

☐ **a)** ☐ **b)** ☐ **c)** ☐ **d)**

> **23** (1p) Address block ([First Addr - Last Addr]) that will be assigned to the R1-R2 network after applying VLSM.

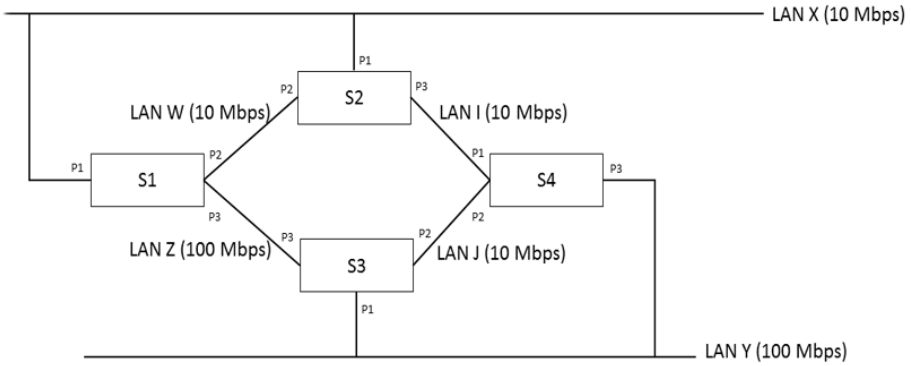
☐ **a)** R1-R2=[116.20.16.0 - 116.20.16.3]
☐ **b)** R1-R2=[116.20.32.0 - 116.20.32.7]
☐ **c)** R1-R2=[116.20.8.0 - 116.20.8.3]
☐ **d)** R1-R2=[116.20.48.0 - 116.20.48.3]

> **24** (1p) What fraction of the address block keeps available for futures hosts after applying VLSM and subnetting to the network A?

☐ **a)** VLSM= 21/1024; Subnetting=15381/16384
☐ **b)** VLSM= 23/2048; Subnetting=15384/16384
☐ **c)** VLSM= 24/1024; Subnetting=7191/8192
☐ **d)** VLSM= 1001/1024; Subnetting=1001/16384

E. [5p] Consider the following figure representing the interconnection of LAN segments X, Y, Z, W, I and J from switches S1, S2, S3 and S4. All switches send BPDUs with priority 32768. The canonical addresses of the switches are:

- MAC S1= 00:01:10:AA:BB:CC
- MAC S2= 00:01:10:A0:B1:C1
- MAC S3= 00:01:10:BB:AF:CF:CF
- MAC S4= 00:01:10:BC:BB:CC



After executing the Spanning Tree Protocol algorithm, answer the following questions:

> **25** (1p) What is the root bridge?

☐ **a**) S1 ☐ **b**) S2 ☐ **c**) S3 ☐ **d**) S4

> **26** (1p) Determine root ports (format: Switch/Port):

☐ **a**) S1/P1, S3/P2, S4/P1
☐ **b**) S1/P1, S2/P1, S3/P2, S4/P1
☐ **c**) S1/P1, S3/P3, S4/P1
☐ **d**) S1/P2, S3/P3, S4/P1

> **27** (1p) Determine designated ports (format: Switch/Port):

☐ **a**) S2/P1, S4/P3, S1/P3, S2/P2, S2/P3, S4/P2
☐ **b**) S2/P1, S3/P1, S3/P3, S2/P2, S2/P3, S4/P2
☐ **c**) S1/P1, S3/P1, S1/P3, S2/P2, S4/P1, S4/P2
☐ **d**) S2/P1, S3/P1, S1/P3, S1/P2, S4/P1, S3/P2

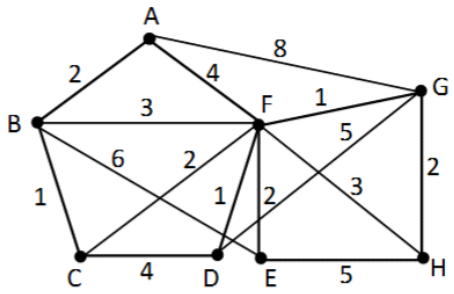
> **28** (1p) Determine blocked ports (format: Switch/Port):

☐ **a**) S1/P3, S3/P1, S3/P3
☐ **b**) S1/P2, S4/P3, S1/P1
☐ **c**) S1/P2, S4/P3
☐ **d**) S1/P2, S3/P1, S3/P2

> **29** (1p) After the convergence of the STP protocol, what is the status of the switches?

☐ **a**) Listening ☐ **b**) Learning ☐ **c**) Forwarding ☐ **d**) Blocked

E. [5p] The following figure represents a network consisting of 8 routers (A-H). The cost of reaching each router is given by the number on each edge. Answer the following questions:



> **30** (1p) What is the minimum path and cost to reach H from A and how many nodes were visited before visiting H?

- ☐ **a)** A-B-C-F-G-H, cost=8, nodes visited=7
- ☐ **b)** A-F-G-H, cost=7, nodes visited=6
- ☐ **c)** A-F-H, cost=7, nodes visited=2
- ☐ **d)** A-F-H, cost=7, nodes visited=7

> **31** (1p) Write the sink tree with C as root that is obtained from the figure above taking into account the cost of the link as a metric. In case of a tie, the alphabetically smallest node is always processed.

- ☐ **a)** C->B->A; C->F->G->H; C->F->E; C->F->D
- ☐ **b)** C->B->A; C->B->E; C->F->G; C->F->H; C->D
- ☐ **c)** C->B->A; C->F->G; C->F->E; C->F->D; C->F->H
- ☐ **d)** C->B->A; C->B->E; C->F->G->H; C->F->D

> **32** (1p) What is the distance vector (VD) of E after updating it in the first iteration? Note the metric is number of hoops. Assume that VDs from alphabetically smaller nodes are processed first.

- ☐ **a)** B,1,-; F,1,-; H,1,-; C,2,B; A,2,B ; E,0,-; D,2,F; G,2,F
- ☐ **b)** B,1,-; F,1,-; H,1,-; C,2,F; A,2,F; E,0,F; D,2,F; G,2,F
- ☐ **c)** B,0,-; F,0,-; H,0,-; E,0,H; G,1,H; C,1,B; A,1,B ; D,1,F
- ☐ **d)** B,0,-; F,0,-; H,0,-; A,1,F; C,2,A; D,2,A; E,2,A; G,2,A

> **33** (1p) What is the value of the send and confirmation flags (ACK) for a link state packet reaching node H, originating in B, and arriving simultaneously through lines B-F-H and B-E-H?

- ☐ **a)** Send[B,F,H]=[0,1,0]; ACK[B,F,H]=[1,0,0]
- ☐ **b)** Send[E,F,G]=[1,0,1]; ACK[E,F,G]=[0,0,1]
- ☐ **c)** Send[E,F,G]=[0,0,1]; ACK[E,F,G]=[1,1,0]
- ☐ **d)** Send[A,B,C]=[0,1,0]; ACK[A,B,C]=[1,0,0]

> **34** (1p) What is the most efficient routing protocol that implements diffusion?

- ☐ **a)** Flooding.
- ☐ **b)** Multicast routing.
- ☐ **c)** Routing in reverse.
- ☐ **d)** Routing through the sink tree.

E. [5p] An University campus has 4 buildings, 1 communications center (DPC) and 3 user communities: administration and services (AS), teachers and students. The security policy indicates that different communities will have different privileges and services. Therefore, a different Ethernet network will be created for each community, regardless of the building in which it is located. In addition will be installed the necessary interconnection elements in the DPC to communicate the 3 networks. Have the aim is to minimise the amount of required wiring. The current layout of the network points for the 4 buildings is as follows:

- Building A: 4 AS, 8 teachers and 40 students.
- Building B: 12 AS, 20 teachers and 100 students.
- Building C: 0 AS, 16 teachers and 0 students.
- Building D: 6 AS, 20 teachers and 200 students.

> **35** Assuming that switches with up to 300 interfaces are available, how many switches (**without** VLAN support) would you need?

- ☐ **a**) 1 per building and 1 at CPD.
- ☐ **b**) 3 per building and 3 at CPD.
- ☐ **c**) A:3, B:3, C:1, D:3 and CPD:3
- ☐ **d**) A:2, B:2, C:1, D:3 and CPD:1

> **36** Assuming that switches with up to 300 interfaces are available, how many switches (**with** VLAN support) would you need?

- ☐ **a**) 1 per building and 1 in CPD.
- ☐ **b**) 3 per building and 3 at CPD.
- ☐ **c**) A:3, B:3, C:1, D:3 and CPD:1.
- ☐ **d**) A:2, B:2, C:1, D:3 and CPD:3

> **37** What interconnection devices are needed (as a mininum) at the CPD if VLAN technology is NOT available?

- ☐ **a**) 3 routers (one per community) with at least 2 interfaces.
- ☐ **b**) 1 router with at least 3 interfaces.
- ☐ **c**) 1 router with 1 *trunk* interface.
- ☐ **d**) 3 routers with at least 1 *trunk* interface.

> **38** What interconnection devices are needed (as a mininum) at the CPD if VLAN technology IS available?

- ☐ **a**) 3 routers (one per community) with at least 2 interfaces.
- ☐ **b**) 1 router with at least 3 interfaces.
- ☐ **c**) 1 router with 1 *trunk* interface.
- ☐ **d**) 3 routers with at least 1 *trunk* interface.

> **39** If switches with VLAN technology have been installed, what would be the minimum task that should be done if a new community of users (research staff, 20 researchers) appears on the campus who will work at building C.

- ☐ **a**) Install a new switch in building C and another one in the DPC.
- ☐ **b**) Configure a new VLAN in all switches.
- ☐ **c**) Configure a new VLAN in the building C' switch.
- ☐ **d**) Configure a new VLAN in the building C' switch and in the DPC' switch.