UCLM
UNIVERSIDAD DE CASTILLA-LA MANCHA

Computer Networks II

Course 18/19 :: Test 2 (extra)

Escuela Superior de Informática

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This exam has 22 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. ***Mobile phones must be switched off and stored during the tests****. The maximum duration of this exam is 90 minutes.*

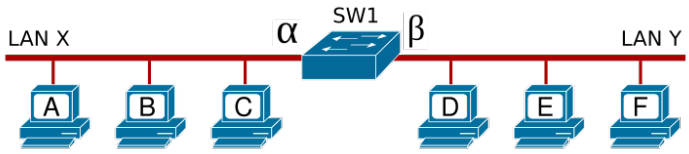
Regarding the ANSWER SHEET:

- *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: _____

E. [5p] Given the following network topology composed by workstations A, B, C, D, E and F and the switch SW1 with interfaces α and β. The MAC address table is initially empty and has the following fields: `dir:interface:timestamp` . The actions that occur have the following format: N(t1)->M: N sends to M on the clock tick 1. Answer the following questions:



> **1** (1p) A(t1)->B, what action does the switch take?

- ☐ **a)** Forwarding
- ☐ **b)** Discarding
- ☐ **c)** Flooding
- ☐ **d)** Pass the frame to the IP protocol and let the router handle it.

> **2** (1p) What is the content of the MAC address table after the previous frame has been sent?

☐ **a)** A:α:t1 ☐ **b)** B:α:t1 ☐ **c)** A:β:t1 ☐ **d)** B:β:t1

> **3** (1p) B(t2)->A, what action does the switch take?

- ☐ **a)** Forwarding
- ☐ **b)** Discarding
- ☐ **c)** Flooding
- ☐ **d)** Pass the frame to the IP protocol and let the router handle it.

> **4** (1p) What is the content of the MAC address table after the previous frame has been sent?

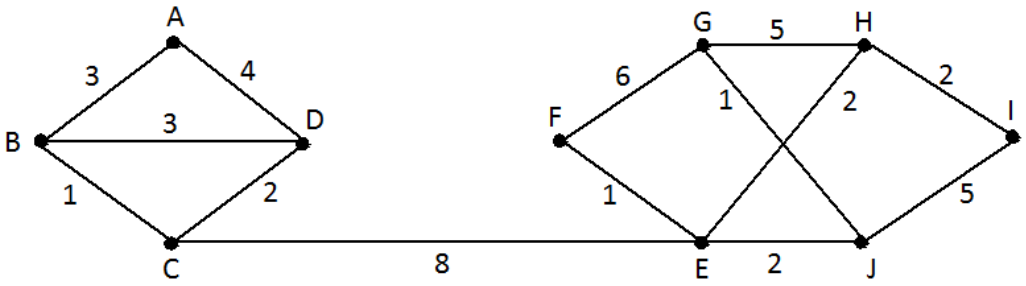
☐ **a)** A:β:t1; B:β:t2 ☐ **b)** B:β:t1; A:β:t2 ☐ **c)** A:α:t1; B:α:t2 ☐ **d)** B:α:t1; A:α:t2

> **5** (1p) Next the following operations occur: C(t3)->D, D(t4)->B, E(t5)->C, E(t6)->D. What is the content of the MAC address table after executing all operations if the entries may remain in the table a maximum time of 4 clock ticks?

☐ **a)** A: α: t1; B: α: t2: C: α: t3; D: β: t4; E: β: t5 ☐ **c)** A: α: t1; B: α: t2: C: α: t3; D: β: t4; E: β: t6

☐ **b)** C: α: t3; D: β: t4; E: β: t6 ☐ **d)** C: α: t3; D: β: t4; E: β: t5

E. [5p] The following figure represents an interconnection network consisting of 10 routers (A-J). The cost of reaching each router is given by the number that appears on each edge. In the event of a tie, the alphabetically smallest node is always processed. Answer the following questions:



> **6** (1p) According to Dijkstra's minimum path algorithm, what is the minimum path and cost of reaching the H node from A and how many nodes were visited after visiting H?

- ☐ **a)** A-D-C-E-H, cost=16, nodes visited=6
- ☐ **b)** A-B-C-E-H, cost=14, nodes visited=7
- ☐ **c)** A-B-C-D-E-H, cost=14, nodes visited=8
- ☐ **d)** A-B-C-E-H, cost=14, nodes visited=5

> **7** (1p) Write the C' sink tree that is obtained from the previous topology taking into account the link cost as metric:

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

> **8** (1p) What is the distance vector (VD) of E after updating it in the first iteration taking into account the metric number of hops? Assume that VDs from alphabetically smaller nodes are processed first and that the cost to a directly connected node is 1:

- ☐ **a)** A, 3, D; B,2,C; C,1,-; D,2,C; E,2,C; F,1,- ; G,2,F; H,1,-; I,2,H; J, 1, -
- ☐ **b)** B,2,C; C,1,-; D,2,C; E,0,-; F,1,-; G,2,J; H,1,-; I,2,J; J, 1, -
- ☐ **c)** B,2,C; C,1,-; D,2,C; E,0,-; F,1,- ; G,2,F; H,1,-; I,2,H; J, 1, -
- ☐ **d)** A, 3, B; B,2,C; C,1,-; D,2,C; E,0,-; F,1,- ; G,2,F; H,1,-; I,2,H; J, 1, -

> **9** (1p) What is the value of the flags of the forwarding vector R [x,y,z] and confirmation vector ACK[x,y,z] for a link state packet reaching node G, with source C, and arriving simultaneously through lines C-E-F-G and C-E-J-G? Assume that x=F, y=H,y z=J and that the vector value is 0 if it is not forwarded/confirmed and 1 if it is forwarded/confirmed.

- ☐ **a)** R[x,y,z]=[0,1,0]; ACK[x,y,z]=[1,0,0]
- ☐ **b)** R[x,y,z]=[1,0,1]; ACK[x,y,z]=[0,0,1]
- ☐ **c)** R[x,y,z]=[0,1,1]; ACK[x,y,z]=[1,0,0]
- ☐ **d)** R[x,y,z]=[0,1,0]; ACK[x,y,z]=[1,0,1]

> **10** (1p) You want to divide the network into two regions Z1 and Z2, Z1 includes routers A, B, C and D and Z2 includes E, F, G, H, I and J. How many entries does the tables of C and E have?

- ☐ **a)** 10 and 10
- ☐ **b)** 4 and 6
- ☐ **c)** 5 and 5
- ☐ **d)** 5 and 7

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.

> **11** 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

> **12** 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

> **13** 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.

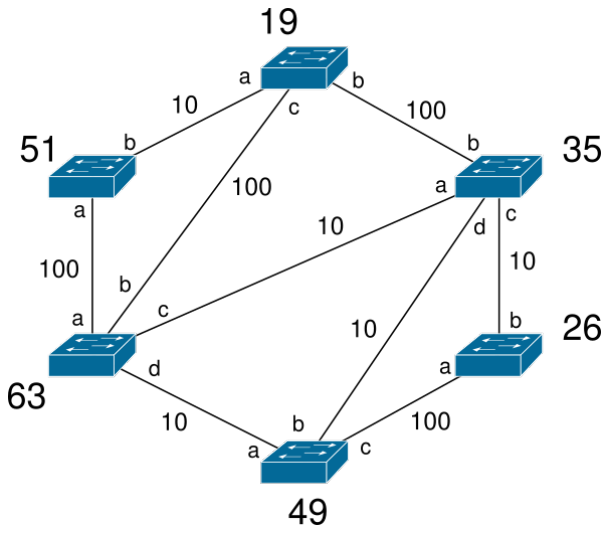
> **14** What interconnection devices are needed (as a mininum) at the CPD if VLAN technology IS available?

- ☐ **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.

> **15** 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.

E. [5p] Consider the following topology consisting of 6 Ethernet switches and 9 LAN segments in which the **cost** is indicated. Answer the following questions assuming that the STP protocol has avoided the existing loops:



> **16** (1p) What is the root switch?

- ☐ **a)** 19
- ☐ **b)** 35
- ☐ **c)** 26
- ☐ **d)** 63
- ☐ **e)** 51

> **17** (1p) Determine the root ports (format: switch/port):

- ☐ **a)** 19/a, 51/b, 63/c, 49/d, 26/a, 35/c
- ☐ **b)** 51/b, 63/b, 49/b, 26/b, 35/b
- ☐ **c)** 51/a, 63/b, 49/c, 26/b, 35/a
- ☐ **d)** 51/b, 63/c, 49/a, 26/b, 35/c

> **18** (1p) Determine the designated ports (format: switch/ports):

- ☐ **a)** 19/a, 51/ab, 63/bc, 49/bc, 35/bcd
- ☐ **b)** 19/abc, 51/ab, 63/b, 49/c, 35/abc
- ☐ **c)** 19/ac, 63/bcd, 49/b, 26/ab, 35/ab
- ☐ **d)** 19/abc, 51/a, 63/d, 26/a, 35/acd

> **19** (1p) Determine blocked ports (format: switch/ports):

- ☐ **a)** 19/ab, 35/dc
- ☐ **b)** 51/a, 63/bc, 26/b
- ☐ **c)** 63/ac, 49/ac
- ☐ **d)** 63/abcd, 49/ac, 26/b

> **20** (1p) As network administrator to which switch would you reduce the priority value to improve LAN performance?

- ☐ **a)** 51
- ☐ **b)** 63
- ☐ **c)** 49
- ☐ **d)** 26
- ☐ **e)** 35

21 [2p] What is the purpose of the IP protocol?

- ☐ **a)** Move packets between the nodes of a LAN or WLAN.
- ☐ **b)** Encapsulate frames through the link gateway.
- ☐ **c)** Move packets through a set of interconnected networks.
- ☐ **d)** Assign a unique hierarchical address to each node of the inter-network.

22 [1p] What is the *routing table* content of a typical IP router?

- ☐ **a)** The cost metric to each subnet neighbor.
- ☐ **b)** The number of hops announced by each neighbor in the last iteration.
- ☐ **c)** The list of all routers to reach each destination on the subnet.
- ☐ **d)** Indicates what to do with each incoming packet given its destination IP.

23 [1p] What is the basic operation of an IP router?

- ☐ **a)** Receives a package, stores it, checks for correctness, determines output interface that corresponds to it and sends the packet through it.
- ☐ **b)** Receive a packet, wait for the reception queue to be full, go through the complete routing table and send the packet to the default route.
- ☐ **c)** Receives a packet, stores it, asks neighboring routers for the destination IP and sends it to the first responder.
- ☐ **d)** Sends an ECHO message to all neighbours, collects replies, check the table and returns the message to the nearest router.

24 [1p] We have a network whose routers are wireless devices powered by batteries and photovoltaic panels. We want to design a routing algorithm for maximize the operating time of that network. Which of the following would be a type of of reasonable algorithm?

- ☐ **a)** Adaptive by flooding.
- ☐ **b)** Adaptive by means of measurements.
- ☐ **c)** Static by flooding.
- ☐ **d)** Static through estimates.

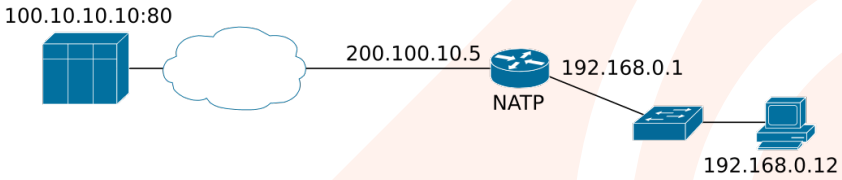
25 [1p] In a dynamic routing algorithm, What is the consequence of considering the time that packets wait in router queues when applying a latency metric?

- ☐ **a)** The cost of a low-latency link will grow as the load increases, so that could produce a convergence problem.
- ☐ **b)** The links with the highest latency will be underused since the tails of the routers will be able to hold a larger number of packets.
- ☐ **c)** Congestion will increase if all neighbors choose the same route regardless of the size of the queues.
- ☐ **d)** It is not possible to apply latency metric in dynamic routing.

26 [1p] What is the purpose of multicast routing algorithms?

- ☐ **a)** Calculate all expansion trees to optimize unicast routing.
- ☐ **b)** Bring a copy of the message to all members of the destination group.
- ☐ **c)** Choose the root router to minimize the number of copies when multiple nodes send a package to the same destination.
- ☐ **d)** Multicast routing does not exist.

27 [1p] Given the next network, which includes a router with NATP. Indicates the valid option. "A TCP segment arrives..."



- ☐ **a)** To the server with ip.dst=100.10.10.10, dst.port=80, ip.src=192.168.0.12 and src.port=4512.
- ☐ **b)** To the server with ip.src=100.10.10.10, src.port=80, ip.dst=192.168.0.12 and dst.port=4512.
- ☐ **c)** To the router with ip.dst=200.100.10.5, dst.port=3471, ip.src=100.10.10.10 and src.port=4512.
- ☐ **d)** To the router with ip.dst=200.100.10.5, dst.port=3471, ip.src=100.10.10.10 and src.port=80.

28 [2p] To a NATP router arrives at a TCP segment with the following values:

- dst ip: 129.12.34.7
- dst port: 38345
- src ip: 212.34.12.4
- src port: 80

From this information and assuming that everything is configured and working correctly, choose the most reasonable option:

- ☐ **a)** It is an HTTP request from a host in the private network.
- ☐ **b)** It is an HTTP response from a public server.
- ☐ **c)** The public IP address of the router is 212.34.12.4.
- ☐ **d)** The router's web server is bound to port 80.

29 [1p] Which of the following protocols is NOT used to create a tunnel in private networks?

☐ **a)** L2TP ☐ **b)** PPTP ☐ **c)** IPSec ☐ **d)** TCPSec

30 [1p] A network based on TCP/IP technology consisting of several distant LANs connected by leased lines that eventually use some service of the public Internet is a...

☐ **a)** intranet ☐ **b)** extranet ☐ **c)** hybrid network ☐ **d)** VLAN

31 [1p] What type is the IPv6 address FF80:ABCD:DDBB::1234?

- ☐ **a)** A global address unicast.
- ☐ **b)** A link local unicast address.
- ☐ **c)** A site local unicast address.
- ☐ **d)** An multicast address.

32 [1p] How is an ICMPv6 protocol message encapsulated?

- ☐ **a)** ICMPv6 packet is encapsulated over IPv6.
- ☐ **b)** In an IPv6 packet as an extension header.
- ☐ **c)** ICMPv6 packet is encapsulated on UDP.
- ☐ **d)** ICMPv6 packet is encapsulated over IPv4.

33 [1p] What address is used to designate the loopback address in IPv6?:

- ☐ **a)** 0:0:0:0:0:0:0:FFFF:IPv4
- ☐ **b)** 0:0:0:0:0:0:0:0
- ☐ **c)** ::1
- ☐ **d)** 0:0:0:0:0:0:0:0:IPv4

34 [1p] Which of the following strategies has not been used during the transition from IPv4 to IPv6?

- ☐ **a)** IPv4/IPv6 dual stack at communication endpoints and routers.
- ☐ **b)** IPv6 tunnels over IPv4.
- ☐ **c)** Query the DNS server to determine if the destination uses IPv6.
- ☐ **d)** Sending an ICMPv6 packet to check connectivity.

35 [1p] Which of the following is not an IPv6 feature?

- ☐ **a)** Plug-and-Play addresses.
- ☐ **b)** 128-bit address format.
- ☐ **c)** A single interface can have multiple addresses of any type.
- ☐ **d)** The fragmentation is a responsibility of the routers.

36 [1p] Why do loops occur when redundant bridges are used?

- ☐ **a)** The redundant bridge cannot differentiate whether the frame is original or one already forwarded by another bridge.
- ☐ **b)** Due to faults in the switches configuration.
- ☐ **c)** Redundant bridges must be removed to avoid loops.
- ☐ **d)** The 'flooding' action should not be used with redundant loops.

37 [1p] Which of the following statements is FALSE about flow control on Ethernet:

- ☐ **a**) The receiver sends a special PAUSE frame to the sender indicating the time it must stop before continuing the transmission.
- ☐ **b**) The flow control is always symmetrical.
- ☐ **c**) The objective is to avoid saturation of the switch.
- ☐ **d**) Flow control can be negotiated over different Ethernet speeds.

38 [1p] How should you interconnect workstations so that they all share the same collision domain?

- ☐ **a**) Each station is connected to a different interface of the bridge/switch.
- ☐ **b**) Each station is connected to a different VLAN.
- ☐ **c**) All stations are connected to a hub and the hub to a bridge/switch interface.
- ☐ **d**) All stations are connected to a router and the router to a bridge/switch interface.