

Duration: 1 hour. Answer the quiz and the problems in the same sheet.

**Quiz. (5 points)** All the questions are multi-answer: 0,5 point if correct, 0,25 if there is one error, 0 otherwise.

<p><b>1. Say which statements are true:</b></p> <p><input type="checkbox"/> The network 147.35.83.2/18 can have at most <math>2^{18}-2</math> hosts.</p> <p><input type="checkbox"/> The IP address 10.1.1.70/28 has the network address 10.1.1.64, broadcast 10.1.1.79 and mask 255.255.255.240.</p> <p><input type="checkbox"/> The IP address 147.10.0.2/18 has the network address 147.10.0.0, broadcast 147.10.63.255 and mask 255.255.192.0.</p> <p><input type="checkbox"/> The IP address 192.168.4.178/29 has the network address 192.168.4.128, broadcast 192.168.4.135 and mask 255.255.255.248.</p>	<p><b>2. Say which of the following protocols/applications use UDP:</b></p> <p><input type="checkbox"/> DHCP</p> <p><input type="checkbox"/> DNS</p> <p><input type="checkbox"/> ping</p> <p><input type="checkbox"/> RIP</p>	<p><b>3. Say which statements are true regarding ARP:</b></p> <p><input type="checkbox"/> Both routers and hosts have an ARP table.</p> <p><input type="checkbox"/> In the ARP table of one host there cannot be any of its IP addresses.</p> <p><input type="checkbox"/> The ARP module will not resolve an IP address that doesn't belong to any of its directly connected networks.</p> <p><input type="checkbox"/> The destination IP address of ARP Request messages is 255.255.255.255</p>
<p><b>4. Assume you have the base IP address 80.0.0.0/24. Say which of the following division in subnets are possible:</b></p> <p><input type="checkbox"/> 8 subnet /27 and 2 subnets /30</p> <p><input type="checkbox"/> 3 subnets /26, 3 subnets /28 and 4 subnets /30.</p> <p><input type="checkbox"/> 1 subnet /25 and 4 subnets /27.</p> <p><input type="checkbox"/> 1 subnet /25, 1 subnet /26 and 2 subnets /27.</p>	<p><b>5. Say which of the following header fields may be changed by a PAT router between an internal network and the Internet:</b></p> <p><input type="checkbox"/> checksum of the IP datagrams.</p> <p><input type="checkbox"/> checksum of the UDP datagrams.</p> <p><input type="checkbox"/> destination port of TCP segments incoming from the Internet.</p> <p><input type="checkbox"/> source port of TCP segments incoming from the Internet.</p>	
<p><b>6. Assuming that cwnd=500 bytes, MSS=100 bytes and ssthresh=500 bytes, say which of the following TCP window sequences would be possible upon receiving 4 acks:</b></p> <p><input type="checkbox"/> 500, 500, 500, 500</p> <p><input type="checkbox"/> 600, 700, 800, 900</p> <p><input type="checkbox"/> 500, 500, 100, 100</p> <p><input type="checkbox"/> 520, 539, 557, 574</p>	<p><b>7. Say which statements are true regarding the IP protocol:</b></p> <p><input type="checkbox"/> When the TTL field is decremented to zero the datagram is discarded.</p> <p><input type="checkbox"/> The checksum is computed using only the IP header fields.</p> <p><input type="checkbox"/> Each time a router discards an IP datagram generates an ICMP message.</p> <p><input type="checkbox"/> The offset field counts in words of 3 bytes.</p> <p><input type="checkbox"/> The TOS field can be used to specify routing preferences.</p>	

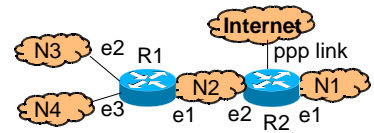
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08:27:18.700967 IP 80.102.155.131.1160 > 64.154.81.168.80: S 2022082028:2022082028(0) win 5808 <mss 1452,sackOK,timestamp 28595315 0,nop,wscale 2>
08:27:18.923703 IP 64.154.81.168.80 > 80.102.155.131.1160: S 2542010622:2542010622(0) ack 2022082029 win 8190 <mss 1452>
08:27:18.923760 IP 80.102.155.131.1160 > 64.154.81.168.80: . ack 1 win 5808
08:27:18.927644 IP 80.102.155.131.1160 > 64.154.81.168.80: . 1:1453(1452) ack 1 win 5808
08:27:18.927694 IP 80.102.155.131.1160 > 64.154.81.168.80: . 1453:2905(1452) ack 1 win 5808
08:27:19.184920 IP 80.102.155.131.1160 > 64.154.81.168.80: FP 2905:3279(374) ack 1 win 5808
08:27:19.227815 IP 64.154.81.168.80 > 80.102.155.131.1160: . ack 2905 win 8190
08:27:20.130693 IP 80.102.155.131.1160 > 64.154.81.168.80: FP 2905:3279(374) ack 1 win 5808
08:29:33.797265 IP 64.154.81.168.80 > 80.102.155.131.1160: R 2542010623:2542010623(0) win 8190
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<p><b>8. Say which of the following statements are true regarding the trace shown in the previous dump:</b></p> <p><input type="checkbox"/> The client has sent exactly 3278 different bytes of data.</p> <p><input type="checkbox"/> The server has sent exactly 0 bytes of data.</p> <p><input type="checkbox"/> The connection has been aborted because the server sent a segment with the RESET flag set.</p> <p><input type="checkbox"/> The awnd sent by the client and the server is the same.</p> <p><input type="checkbox"/> The first two segments carrying data have been received correctly.</p>	<p><b>9. The following dump is obtained in a host. Write after the dots in each line C and S is the host is acting as client and server, respectively.</b></p> <pre>\$ netstat -n Proto local address          remote address          state TCP    127.0.0.1:49351         127.0.0.1:413          ESTABLISHED..... TCP    127.0.0.1:413          127.0.0.1:49351        ESTABLISHED..... TCP    192.168.1.130:49373    212.106.219.32:80      CLOSE_WAIT..... TCP    192.168.1.130:49676    192.168.1.128:139      ESTABLISHED..... TCP    192.168.1.130:49677    192.168.1.128:139      ESTABLISHED.....</pre>
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19:29:54.200341 147.83.32.3.53 > 147.83.34.125.1069: 63281 q: A? www.itu.org. 1/3/2 www.itu.org. A 156.106.202.5 ns: itu.org. NS ns.isi.edu., itu.org. NS ns.itu.ch., itu.org. NS ns1.ip-plus.net. ar: ns.isi.edu. A 128.9.128.127, ns1.ip-plus.net. A 164.128.36.34 (153)
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<p><b>10. Say which statements are true regarding the previous dump:</b></p> <p><input type="checkbox"/> It is a DNS-Reply messages of the name www.itu.org</p> <p><input type="checkbox"/> It carries 5 resource-records in total</p> <p><input type="checkbox"/> The name server ns.isi.edu is one of the authorities of the domain itu.org</p> <p><input type="checkbox"/> ns.itu.ch is a name server with IP address 128.9.128.127</p>
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net	address	mask	net	address	mask
N1	200.0.0.0	255.255.255.128	N3	200.0.0.192	255.255.255.224
N2	200.0.0.128	255.255.255.192	N4		



**Question 1.** (3 points) Assume that the base address in the network of the figure is 200.0.0.0/24. In the network it is used RIP version 2 with split horizon. All hosts have access to the Internet. RIP updates of R2 advertize a default route. Answer the following questions explaining your assumptions.

**1.A** (1 points) Give a possible address/mask for network N4, such that we can connect as much hosts as possible in N4. Give the mask in dotted notation, and say how many hosts could be connected in N4.

**1.B** (0,5 points) Give a possible IP address for the interfaces of the routers:

R1-e1:	R2-e1:
R1-e2:	R2-e2:
R1-e3:	

**1.C** (0,75 points) Write the routing table of R1 when RIP has converged (in the Destination you can use N1,...)

Destination	Gateway	Interface	RIP Metric

**1.D** (0,75 points) Say which is the contents of the RIP update messages sent from R2 to R1

**Question 2.** (2 points) Suppose that 2 PCs are connected to the Internet using the telephone network with 56 kbps modems. One connects to the other and downloads a web page of 5000 bytes (MSS=1460). Draw a time diagram showing all the segments that will be exchanged by the TCP connection (indicating relevant flags). Assuming a host-to-host delay of 0,1 ms, estimate the duration and throughput of the download. Say what will be the congestion window at the server side at the end of the page download. What will be the optimal window of the connection (in segments)? Explain the assumptions you do.