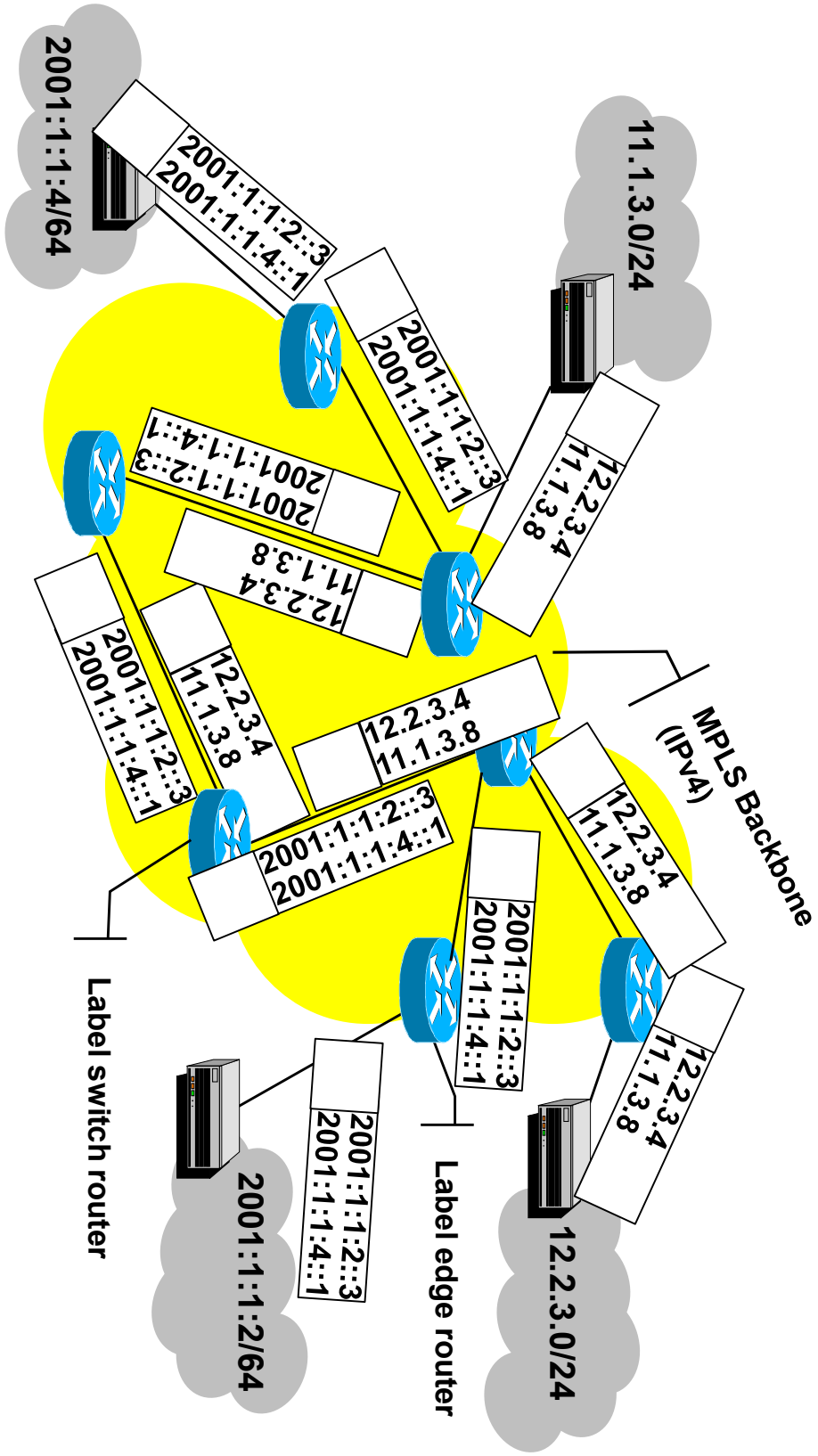
Computer Networks Technologies and Services	**February 8th, 2017**
First and last name	Student ID .....….....

NOTES

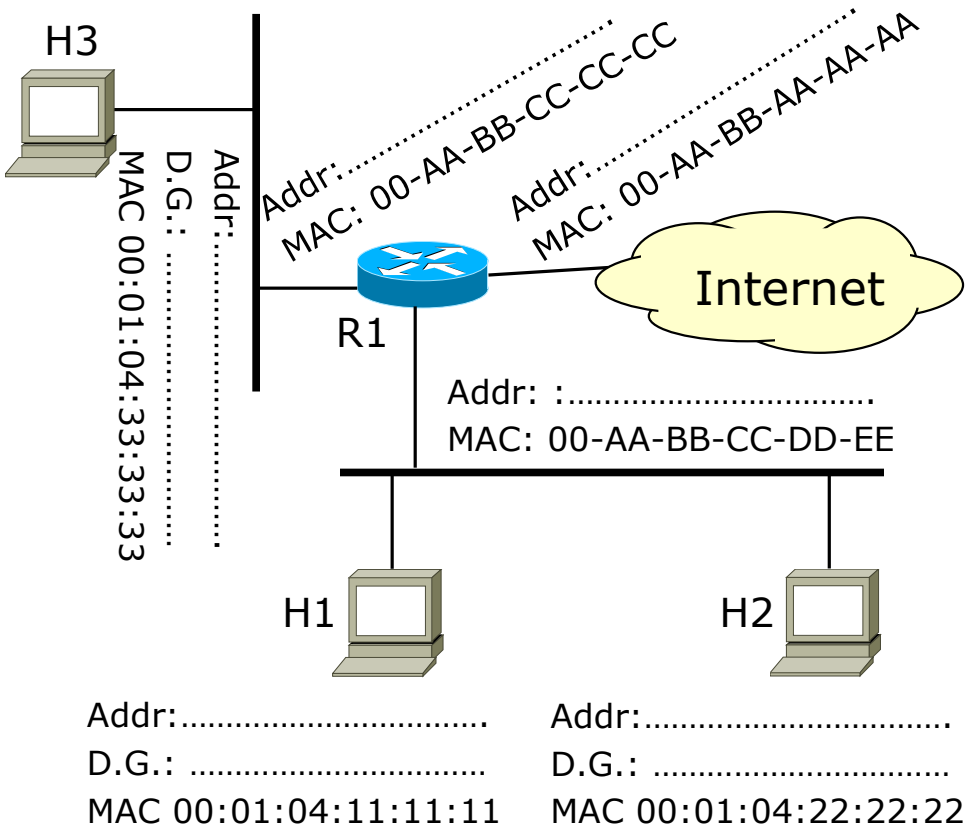
i. Nothing else than what is needed to write (pen, eraser), a piece of ID, and possibly water and food can be taken to the seat where you take your exam. Please leave any other item you might have (coat, bag, phone, calculator, and any other object) at the front or back of the classroom.
ii. The answers to each question must be written exclusively on the same page of the question, which is the only material that will be graded.
iii. Do not forget to write your name and student ID in each one of the marked spaces on the exam paper.
iv. In case you will use part of pages containing the questions as a scratch pad, please indicate it clearly and possibly cross out such parts before handing in the exam.
v. The score assigned to answers varies from zero to the maximum score reported at the end of the question. Please notice that the maximum scores of all questions do not necessarily sum up to 30.
vi. When answering questions, please feel free to use drawings whenever they can help expressing and clarifying the answer.
vii. Answers that are not understandable (for example because written badly or with bad handwriting) might be considered wrong.
viii. During the test, any communication with other classmates is prohibited and will cause the student to be sent away from the classroom
ix. The instructors and the assistants that are present during the test are there for the sole purpose of verifying proper progress of the exam. Their role is not giving any support to the interpretation of the text, neither helping the students to correctly formulate the answers. Please avoid any such request.

Question 1) Briefly describe the role of DNS in the context of SIP explaining all types of interactions (specifying their purpose and main parameters) that can take place with DNS servers during the operation of the several SIP components (phones, proxies, etc.). (4 points)

Question 2) With reference to the MPLS network depicted in the following figure, specify (directly in the boxes in front of packets in the figure) the MPLS label(s) possibly prepended to each of the packets shown in the figure (leave the box blank if no MPLS header is used; in case more than one label is present, write on the outside the one at the top of the label stack). Consider packets to be in transit on the link close to which they are depicted. Consider that the address written on the top in the packets is the source one, while the address underneath is the destination one. (6 points)

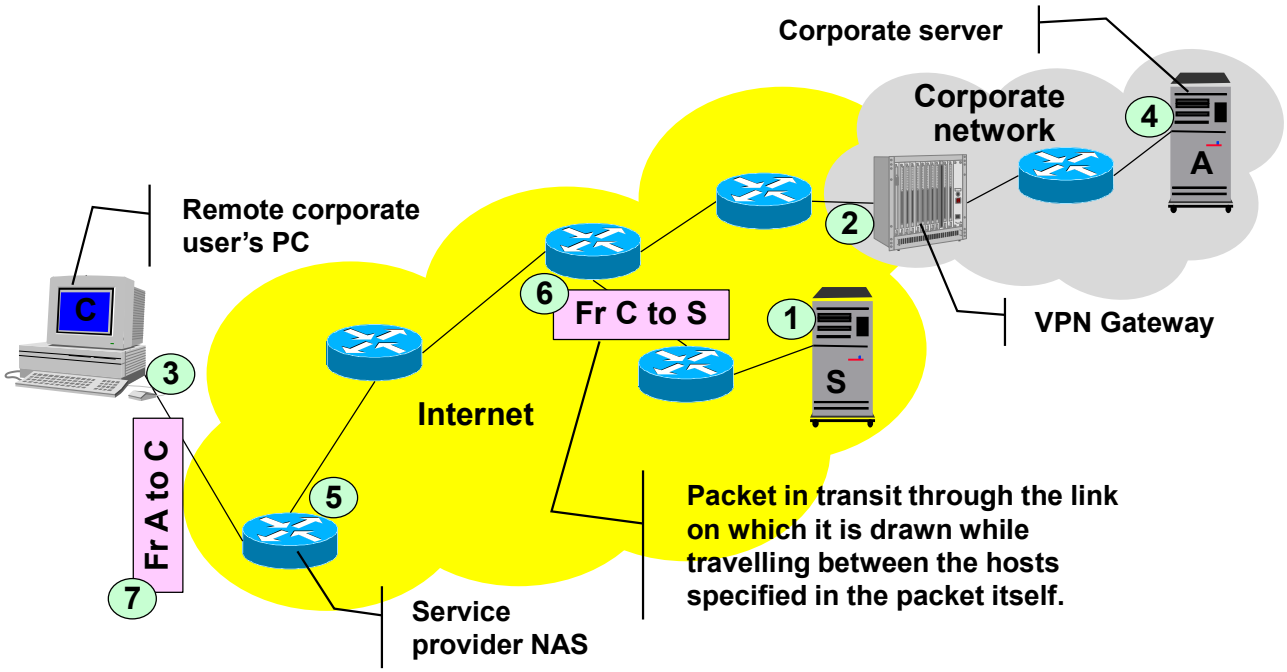


Question 3) After filling out the blanks in the picture with the proper IPv6 addresses, write, directly in the table below, relevant information in packets exchanged on the network when the user of H1 executes the program `ping` to the address of H2. Use the "Upper layers" cells to specify information related to protocols encapsulated inside IP packets that are relevant in this scenario. Please list at most 5 packets; in case fewer are generated, it is not necessary to use all the rows in the table below. Assume H1 and H2 never exchanged packets before. (6 points)



Pkt. 1	MAC src.	MAC dest.
	IP src.	IP dest.
	Upper layers	
Pkt. 2	MAC src.	MAC dest.
	IP src.	IP dest.
	Upper layers	
Pkt. 3	MAC src.	MAC dest.
	IP src.	IP dest.
	Upper layers	
Pkt. 4	MAC src.	MAC dest.
	IP src.	IP dest.
	Upper layers	
Pkt. 5	MAC src.	MAC dest.
	IP src.	IP dest.
	Upper layers	

Question 4) Given the customer provisioned access VPN with centralized Internet access scenario depicted in the following figure, indicate (directly in the table below) the IP addresses assigned to the interfaces and included in the packets marked with a number. Interface addresses can be chosen freely as long as they are compatible with the operating principles of IP and the common deployment practices of this specific access VPN solution. As far as packets are concerned, please explicitly provide both source and destination IP addresses and, in case multiple IP headers be deployed (tunneling), explicitly list the IP address pair (source and destination) within each of the headers, clearly specifying the header (i.e., internal or external) they belong to. As far as interfaces are concerned, please list all IP addresses assigned to them if the specific VPN deployment scenario requires them to have more than one address. (5 points)



1)	2)
3)	4)
5)	
6)	
7)	