| Computer Networks Technologies and Services	February 3rd, 2016
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) With reference to the network scenario depicted in the following figure, specify (directly in the boxes in front of packets in the figure) the MPLS labels possibly prepended to each of the packets shown in the figure. (6 points)
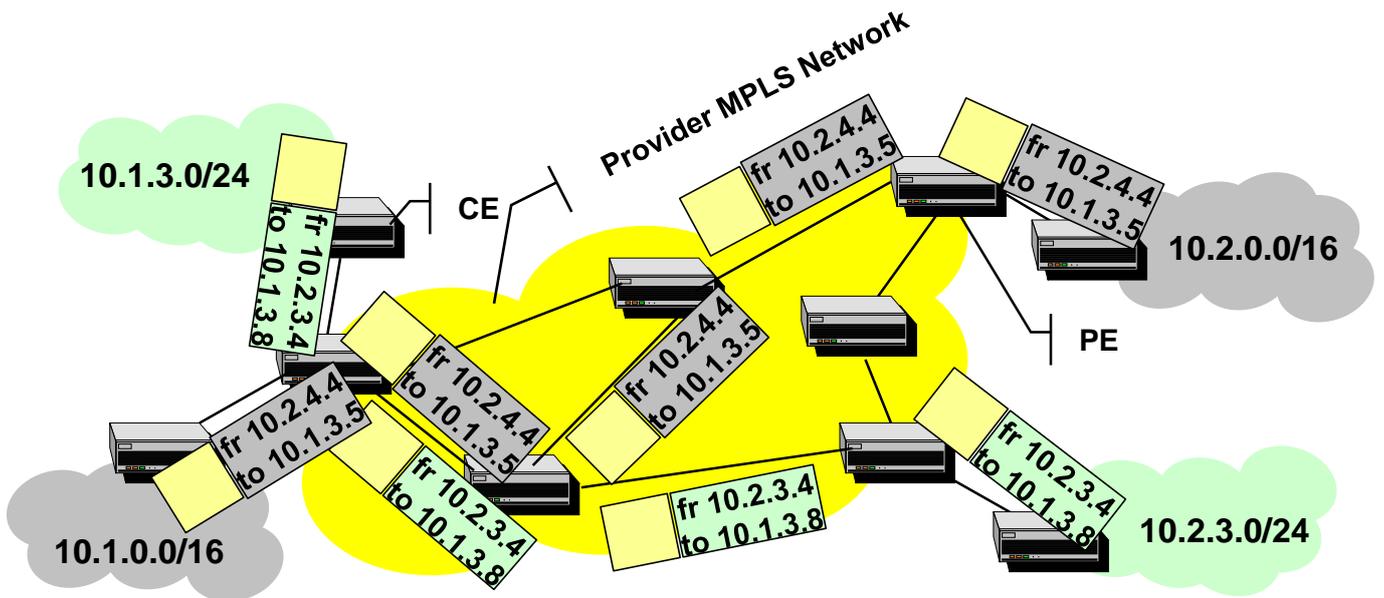
Question 2) With reference to the IPv6 network depicted in the following figure, assign an address to each of the router interfaces and indicate it directly in the figure close to the interface itself. Also specify (directly in the dashed boxes) the information contained in the routing table of the corresponding router to enable it to route packets to each of the destination networks depicted in the figure (9 points)

2001:1:1:4/64

2001:1:1:3/64

2001:1:1:2/64

2001:1:1:1/64
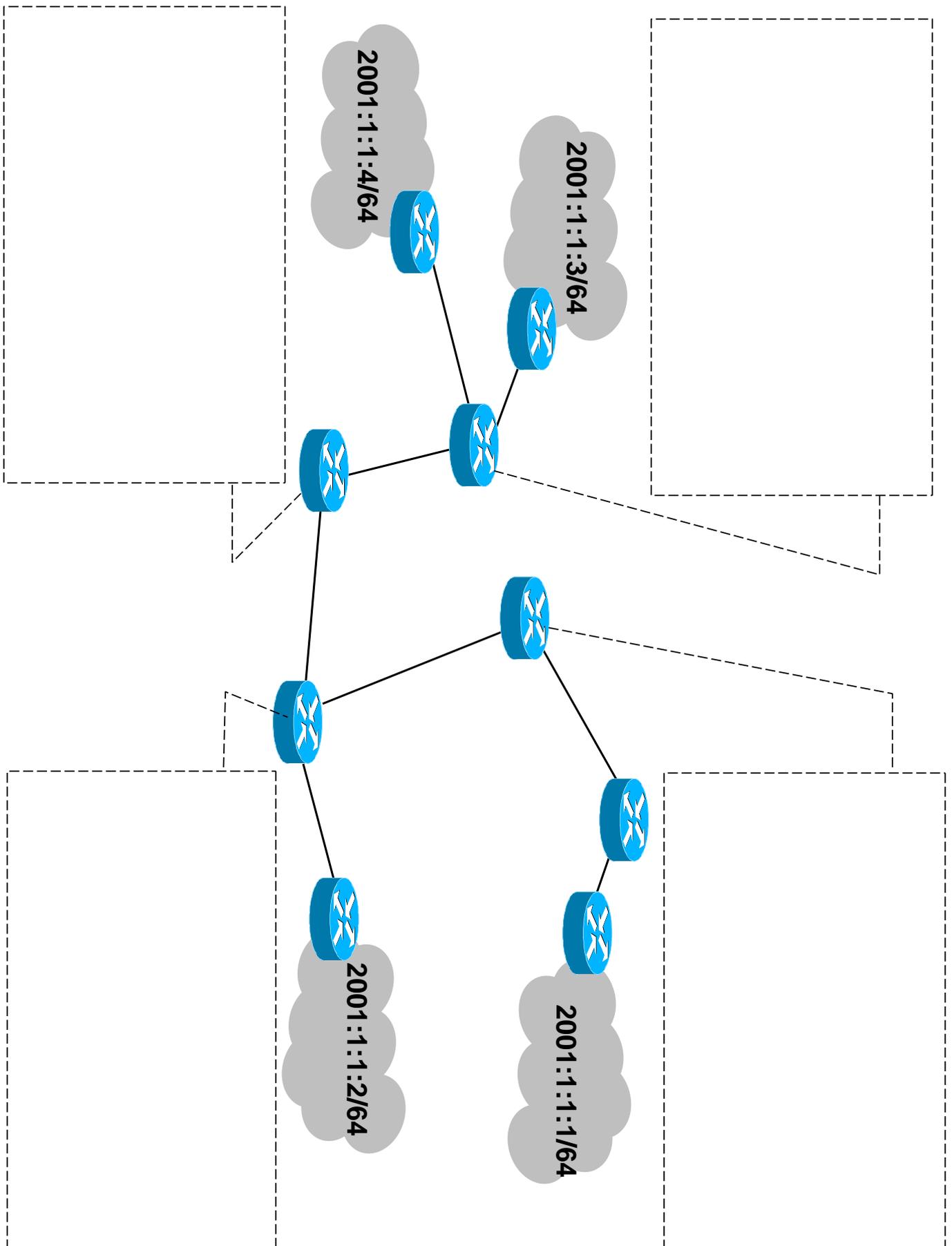
Question 3) Given the following capture file with SIP messages, answer the following questions: (7 points)

- A. Indicate the IP addresses of the caller UA
- B. Indicate the IP address of the called UA.
- C. Knowing that the capture was taken on the interface of one of the systems involved in the message exchange, please indicate which one.
- D. Is record routing enabled? (Please motivate the answer)

Source IP	Destination IP	Protocol	Description
130.192.18.23	130.192.16.62	SIP/SDP	INVITE SIP:mario@130.192.16.62:7234
130.192.16.62	130.192.18.23	SIP	Status: 180 RINGING
130.192.16.62	130.192.18.23	SIP/SDP	Status: 200 OK
120.149.210.3	130.192.16.62	SIP/SDP	ACK SIP:mario@130.192.16.62:7234
130.192.16.62	120.149.210.3	SIP	BYE SIP:lina@120.149.210.3:6734
120.149.210.3	130.192.16.62	SIP	Status: 200 OK

A.

B.

C.

D.

Question 4) The employees of a company can connect to their corporate network through a VPN software, which terminates all its traffic on a VPN gateway with address 11.2.1.3. Through that connection, employees have access to all the services available on the corporate network. Concisely describe (best with a drawing) a packet sent from a remote employee's laptop (while the VPN service is in use) and going to a corporate server (IP address 11.3.3.3) captured

    A) On the link connecting the corporate network to the Internet

    B) On the network interface of the server with address 11.3.3.3

    C) On the network interface of the employee's laptop.

Assume a centralized Internet access, the IP address of the client to be 1.2.3.4, while the IP address assigned to the client within the VPN is 11.2.2.5.

Please explicitly show all of the protocol headers deployed and for each of them the content of the fields that play a key role in ensuring proper functioning (e.g., source and destination IP addresses, etc.) (8 points)