

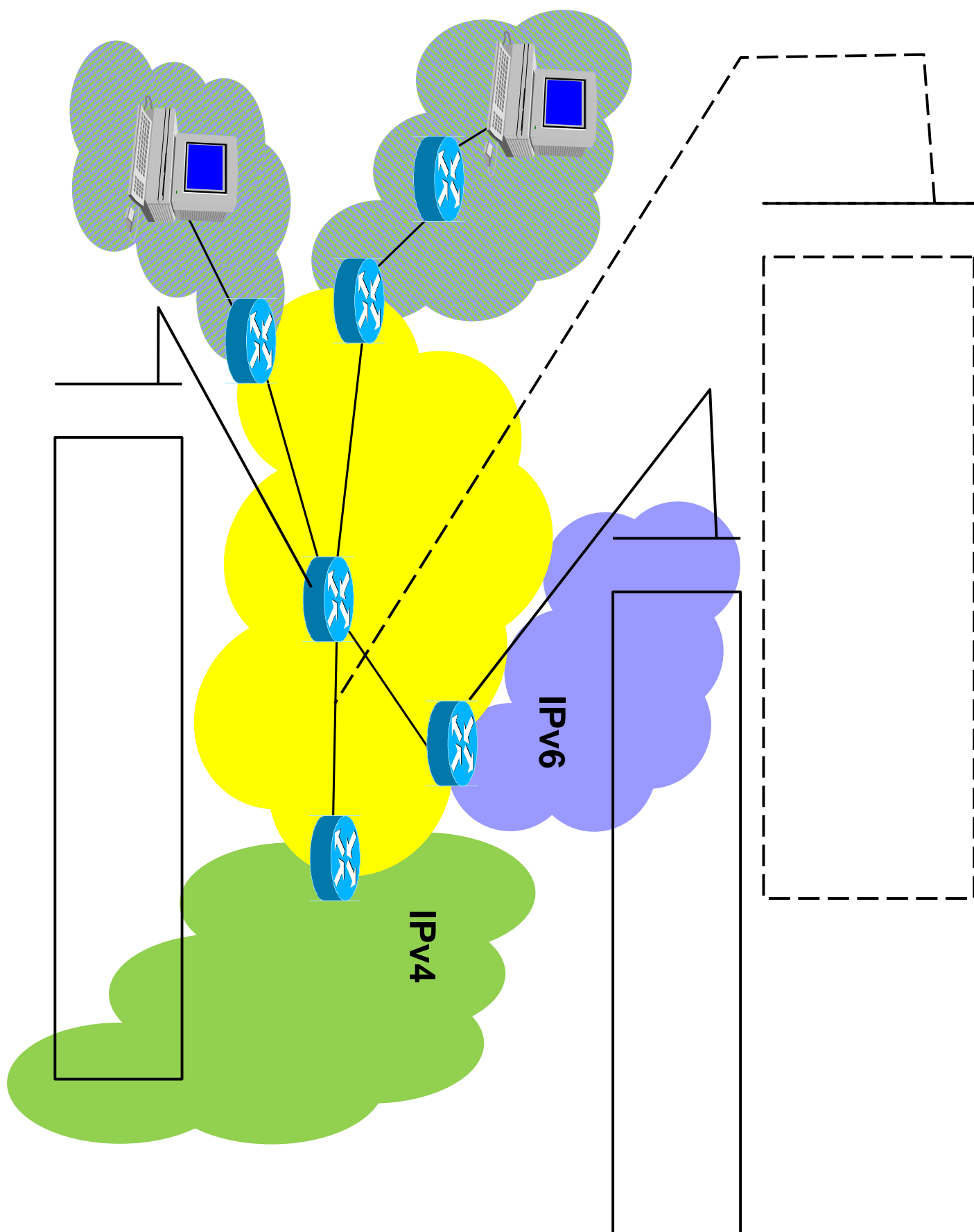
<b>Computer Networks Technologies and Services</b>	<b>September 12<sup>th</sup>, 2018</b>
First and last name .....	Student ID .....

## 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)** Considering that the figure below represents a typical A+P deployment scenario during the transition from IPv4 to IPv6,

1. Assign one or more IP addresses to each interface of each host and network device (writing it directly on the figure, close to the interface itself) that are required to enable the two hosts in the figure to communicate with one another, the IPv4 internet, and the IPv6 internet, while minimizing the number of entries in the IPv6 routing tables of all routers shown in the figure. (8 points)
2. Annotate (directly on the figure) the (name of the) role played by devices and/or functionality offered (beyond regular IP packet forwarding) and their parameters that are key for the A+P solution to actually work. (4 points)
3. Schematically describe (in the large dashed box) a packet transiting on the link indicated in the figure, highlighting information carried by the various headers that is instrumental to the A+P solution functioning properly. (6 points)
4. Write, directly in the smaller solid line boxes, the entries of the routing tables of the corresponding routers that enable the two hosts to exchange packets with hosts in the IPv6 internet. (6 points)



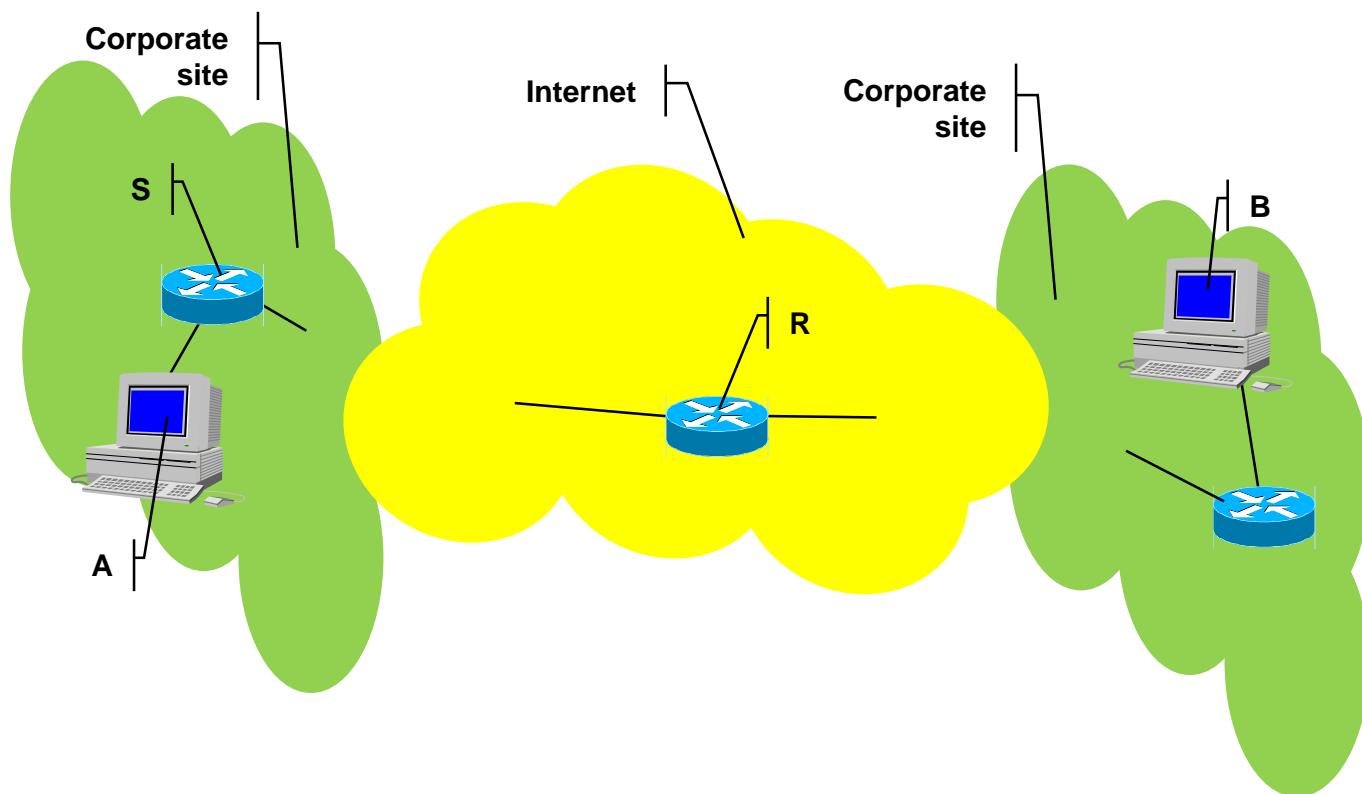
**Question 2)** A SIP user with address `alice@xyz.com` is connected to the network of her Internet service provider and starts her software phone to call `bob@iptel.org`. Assuming that the softphone static configuration includes only the SIP address of its user, list in a schematic fashion all the messages sent and received by the SIP proxy server of the caller, from the instant the software phone is launched to the instant in which the user starts talking to the called party. Consider messages of all possible involved protocols and show information they contain that is key to the operation of the VoIP call. (10 points)

**Question 3)** Given the scenario depicted in the figure below, (i) draw directly on the picture the key devices – specifying their role (i.e., technical name) – required to implement a Layer 3 MPLS VPN solution between the two corporate sites, (ii) describe the routing information exchanged by such key devices and by router R, and (iii) concisely describe (best with a drawing) a packet sent from host A to host B captured

A) On the right hand side link of router S;

B) On the left hand side link of router R.

Please explicitly show all of the relevant protocol headers specifying for each of them the content of the fields that play a key role in making the solution work (e.g., source and destination IP addresses, etc.) (12 points)



ii.

iii.A)

iii.B)