

Computer Networks Technologies and Services	January 31st, 2014	
First and last name	Student ID	

Answers to multiple choice questions

1	2	3	4	5	6	7	8	9	10

Answers to essay questions

Question 11

Question 12

Question 13

NOTES

- i. The answers to all questions, both multiple choice and open answer ones, must be written exclusively on the answer sheet. The length of the open answers should be limited to the space effectively available on such sheet.
 - ii. During the exam, the use of any other sheet of paper beside those provided with the text is not allowed. Only the content of the answer sheet will be taken into account for the evaluation.
 - iii. In case of ambiguity in the text, please write on the sheet for the answers the given interpretation.
 - iv. Multiple choice questions have only ONE correct answer.
 - v. A correct answer is not necessarily exhaustive and its content is not necessarily always and universally true under any condition (i.e. correctness does not imply generality)
 - vi. The score assigned to the answers of multiple choice questions is the following:
 - a. TWO points for a correct answer
 - b. ZERO points if no answer is given
 - c. ONE point will be subtracted to the final result for every wrong answer
 - vii. The score assigned to essay questions varies from ZERO to the maximum score reported at the end of the question.
 - viii. When answering essay questions, please feel free to use drawings whenever they can help expressing and clarifying the answer.
 - ix. Answers that are not understandable (for example because written badly or with bad handwriting) might be considered wrong.
 - x. During the test, any communication with other classmates is prohibited and will cause the student to be sent away from the classroom
 - xi. The teachers 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.
 - xii. If less than 10 points are scored in multiple-choice questions the exam cannot be passed.
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1. The MPLS (Multi-Protocol Label Switching) architecture is characterized by:
 - A. End-systems that are able to negotiate with the network the label of packets they generate.
 - B. Intelligent terminals that can personalize services received from the network.
 - C. Routing protocols that are extremely fast in updating routing tables when topology changes occur, in order to ensure fast fault recovery.
 - D. A different mechanism (with respect to pure IP) for selecting the output interface toward which a packet should be forwarded.
 2. Which of the following features are part of a voice gateway (or VoIP gateway)?
 - A. It forwards packets from a public IP network to a private one.
 - B. It translates voice streams generated over a packet network (e.g. using SIP or H323) into telephone calls over a traditional telephone network.
 - C. It encrypts a voice signal arriving from a traditional telephone network, before forwarding it over the Internet.
 - D. It synchronizes different RTP streams (lip synch).
 3. Does a version of DHCP for IPv6 exist?
 - A. It does not exist, because stateless autoconfiguration alone solves the same problem.
 - B. It does not exist, because stateless autoconfiguration and router advertisements solve the same problem.
 - C. DHCPv6 does exist.
 - D. It does not exist, because it is more secure if the hosts are configured manually

4. In the IPv6 protocol, the IP packet header:
 - A. Is always authenticated through the utilization of proper encryption algorithms in order to increase the security of communications.
 - B. Has small size when compared to the IPv4 header, in order to reduce protocol overheads, thereby increasing bandwidth efficiency.
 - C. Includes only fixed size fields that carry the required information in each packet.
 - D. Includes some fields, available in IPv4 only as options, to offer features that turned out to be largely used in IPv4.
5. Virtual private networks (VPNs) are used for:
 - A. Transporting private traffic over a shared infrastructure creating the same conditions that one would have by using a private infrastructure
 - B. Dividing a local area network of a company in a set of different subnetworks for different business activities (sales, purchases, engineering, marketing)
 - C. Partitioning a private network (for example the network of the main company with a number of secondary business units) in different networks virtually divided.
6. What is the role of NAPTR records in SIP?
 - A. They are used to discover the names of the SIP servers of a given domain.
 - B. They are used to discover the SIP services available in a given domain.
 - C. They are used to translate the name into the IP address of the SIP servers.
 - D. They include the IP address of the called SIP user.
7. What is the SDP role in SIP telephony?
 - A. It is used to carry the description of the main parameters of the conversation that is about to start.
 - B. It is used to reserve the required resources to obtain the quality of service needed for the phone call.
 - C. It is used to locate the IP address of the called user.
 - D. It is used to encapsulate the audio/video samples during the phone call.
8. Why are Access Virtual Private Networks used?
 - A. They are used to allow access to the Internet, using a private access network.
 - B. They are used to deploy existing cabling infrastructures to provide wide-band services.
 - C. They are used to build a public infrastructure, by using a private ones.
 - D. They are used to connect two site of an organization, by using a dedicated link.
9. Why is MPLS important?
 - A. In such networks, it is possible to deploy routers with a specific support to guarantee the required quality of service.
 - B. It enables a single control plane for different switching technologies.
 - C. It is based on devices that do not require to be configured.
 - D. It allows distributing traffic among several equivalent servers.
10. What is the goal of PPTP (Point-to-Point Tunnelling Protocol)?
 - A. To implement site-to-site VPNs.
 - B. To implement access VPNs.
 - C. To implement only VPNs with centralized Internet access.
 - D. To implement only VPNs with distributed Internet access.

11. Explain how an LSP (label switched path) is set up on an MPLS network describing the various steps and protocols involved. [9 points]
12. A company with branches in London and Paris has decided to adopt a flexible work policy whereby employees are allowed to telecommute (i.e., work from their homes). In order to implement such a policy the company needs to make sure that employees can access corporate IT services offered by servers running in the corporate data centers in both Paris and London, while avoiding to open the access to such services to the public (i.e., they should not be available to general users connected to the Internet). Design a solution that enables the company to achieve these goals, specifying which devices and networking features the company might need, where they should be installed, and how they should be configured (indicating which protocols will be deployed). Motivate each design choice. Feel free to deploy drawings wherever they might help in supporting the explanation. [12 points]
13. Consider a SIP user `alice@domain1.com` activating her SIP softphone and connecting to her SIP domain to make a SIP call to user `bob@domain2.com`, already registered with his domain. List all messages, of all protocols possibly involved, exchanged since the activation of Alice's softphone. Feel free to graphically represent the above mentioned message exchange.

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