Instructions for TDTS06 remote exam Jan 5th, 2022, 14:00-18:00 (19:30)

1. In this exam, you will answer one of ten question sets, the one which number corresponds to the last digit (least significant) of your (LiU login id plus 9) mod 10. I.e., id 232 solves set 1.1, 1.2,…, 1.5 and id 239 solves set 0, etc.

2. Please type-in your answers in English. Each question has the target answer length listed (0.5-2 pages). The average one spaced page usually contains about 3000 characters or 500 words. Do not attach hand-written answers nor figures but submit answers **as a single ASCII .txt file** (spell checking encouraged). You can draw in ASCII characters if needed (RFC8140).

3. You can use any printed and online materials available, but you must answer all questions yourself. No group work or outside help is allowed. **Do not copy-paste text** from other sources, as the answers will be checked through Urkund for plagiarism. By taking the exam, you accept a solemn obligation not to cheat.

4. The questions will be available in course Lisam (https://lisam.liu.se/) room "Submissions" after the exam starts. The duration of the exam is 4 hours, and results must be submitted in the course Lisam room before the deadline.

5. No last-minute participation is allowed, pre-registration is required.

6. Please join a zoom meeting during the exam with video on, mic muted. You can use a smartphone with camera, for example. If you need to ask a question, type a message in the private chat to the examiner. Short breaks are ok, but it is expected that most of the time you will be clearly alone in front of a camera. Otherwise, the examiner can contact you afterwards with oral questions to make sure the exam is written by you. https://liu-se.zoom.us/j/68311618835?pwd=NDN6VkoxNTNDOTJ1ZEtKSUdabUtCdz09

7. The grading is U, 3, 4, 5 based on the correctness and clarity of answers, displayed understanding of the material, and how close are the answers to indicated page limit. 1-page questions - 10 points, 0.5 page – 5 points. Grade limits 20; 28; 36 points out of 40.

8. The exam is not anonymous due to the exceptional situation of COVID-19. Please show understanding and tolerance of potential grading delays and technical issues.

9. Emergency contact: Prof. Andrei Gurtov, gurtov@acm.org, +46700850566, skype: gurtov

10. Good luck!

Home exam questions

1. Question set
   1.1. Why do we need protocol layering? Describe the role of each layer (1 page)
   1.2. Describe the role of HTTP protocol. Summarize different versions (1 page)
   1.3. Describe how confidentiality and integrity is provided for email messages. (1 page)
   1.4. How do config errors made in OSPF vs BGP affect Internet operation? (0.5 page)
   1.5. How does a self-learning switch make its table? (0.5 page)
2. Question set
   2.1. Compare recursive and iterative DNS resolvers. What are security challenges in DNS? (1 page)
   2.2. Compare go-back-N vs selective repeat mechanisms. Which one is used in TCP? (1 page)
   2.3. List most common Internet applications and explain which transport protocol they use and why. (1 page)
   2.4. What is encapsulation/decapsulation and tunneling? (0.5 page)
   2.5. Compare P2P versus client-server model. What are strong & weak sides? (0.5 page)
3. Question set
   3.1. Describe 7 "bad things" that can happen with a packet on the Internet. What are solutions to those problems? (1 page)
   3.2. Compare packet switching with circuit switching (1 page)
   3.3. Explain the role and functioning of ARP. What is equivalent for IPv6? (1 page)
   3.4. What is packet fragmentation and how it is handled in IPv4 vs IPv6? (0.5 page)
   3.5. Describe the differences between flow and congestion control (0.5 page)
4. Question set
   4.1. Describe typical architectures and role of a router (1 page)
   4.2. What is multicast, is it deployed in the Internet? (1 page)
   4.3. Explain the concept of SDN (1 page)
   4.4. What is an MTU, typical values, difference to MSS? (0.5 page)
   4.5. Explain the functioning of HTTP Adaptive Streaming (0.5 page)
5. Question set
   5.1. Compare link state vs distance vector routing (1 page)
   5.2. Describe slow start and fast retransmit mechanisms in TCP Reno (1 page)
   5.3. Why is IPv6 needed, differences to IPv4, what is adoption status? (1 page)
   5.4. Which protocols are used for intra-domain routing and why? (0.5 page)
   5.5. How bit errors are detected in link vs network layer protocols? (0.5 page)
6. Question set
   6.1. Describe CSMA/CD and difference with CSMA/CA. (1 page)
   6.2. Describe the role and working of BGP. (1 page)
   6.3. Compare the use of TCP vs UDP for streaming. (1 page)
   6.4. What are pro and cons of SSL vs IPsec? (0.5 page)
   6.5. Which problem is the poison reverse solving and how? (0.5 page)
7. Question set
   7.1. What are most popular standards for WiFi in use now and why? (1 page)
   7.2. How certificates are used to secure WWW? (1 page)
   7.3. Describe how a moving host can change its IPv4 address using Mobile IP? (1 page)
   7.4. Why is CDMA a popular method? (0.5 page)
   7.5. What are classes of multimedia applications? (0.5 page)

8. Question set
    8.1. How is QoS is supposed to be implemented in the Internet. (1 page)
    8.2. What are different approaches for Medium Access Control? (1 page)
    8.3. What is the longest prefix matching and how it is used? (1 page)
    8.4. How is the hidden terminal problem solved? (0.5 page)
    8.5. What are pros and cons of Generalized Forwarding? (0.5 page)
9. Question set
    9.1. Compare the properties of symmetric vs asymmetric cryptography. (1 page)
    9.2. Describe the source and effect of queuing, propagation, transmission delays. (1 page)
    9.3. Describe the evolution of telecommunication networks from 1G to 5G (1 page)
    9.4. Describe the principle behind store-and-forward (0.5 page)
    9.5. What are CDNs, why those are needed, what are common examples? (0.5 page)

0. Question set
    0.1 Describe in detail what happens when you connect a laptop to WiFi with WPA2 PSK to the Internet (1 page)
    0.2 Now a user opens a browser to access https://www.google.com (1 page)
    0.3 Explain how is a web page with 3 local and 3 remote images is downloaded by a web browser using persistent connections with pipelining? (1 page)
    0.4 Summarize modern standards for encryption and hash algorithms (0.5 page)
    0.5 What are pros and cons of using 2.4GHz (IEEE 802.11b) versus 5GHz (IEEE 802.11a)? (0.5 page)