Försättsblad till skriftlig tentamen vid Linköpings Universitet

(fylls i av ansvarig)

Datum för tentamen	*2011-08-23*
Sal	*TER4*
Tid	*14-18*
Kurskod	*TDTS06*
Provkod	*TEN1*
Kursnamn/benämning	*Datornät*
Institution	*IDA*
Antal uppgifter som ingår i tentamen	*8*
Antal sidor på tentamen (inkl. försättsbladet)	*5*
Jour/Kursansvarig	*Niklas Carlsson*
Telefon under skrivtid	*013-28 26 44*
Besöker salen ca kl.	*kl. 15 och 17*
Kursadministratör (namn + tfnnr + mailadress)	*Madeleine Häger Dahlqvist 013-282360, madha@ida.liu.se*
Tillåtna hjälpmedel	*miniräknare med tömda minnen, manuellt språklexikon samt 4 sidor handskrivna anteckningar på linjerat papper.*
Övrigt (exempel när resultat kan ses på webben, betygsgränser, visning, övriga salar tentan går i m.m.)	
Vilken typ av papper ska användas, rutigt eller linjerat	
Antal exemplar i påsen	

LiTH, The Institute of Technology at Linköping University
IDA, The Department of Computer and Information Science
Juha Takkinen
2011-07-04

Written examination in TDTS06 Computer Networks 2011-08-23 at 14–18

Support materials

A basic calculator with memory erased and an English dictionary (not electronical) are allowed. Also four pages with *handwritten* notes on standard *lined* paper, with one line of text on each line on the paper 1 cm apart, are permitted.

Results

The results will be published at latest twelve working days after the exam.

Points

Maximum is 40 points (46 if you have earned bonus points from the optional assignment or handing in labs on time). For grade 3, then 20 points are needed. For grades 4 and 5, 28 points and 36 points, respectively, are needed.

Teacher on duty

Niklas Carlsson 013-282644, will visit the hall around 3 p.m. and at 5 a.m.

Instructions

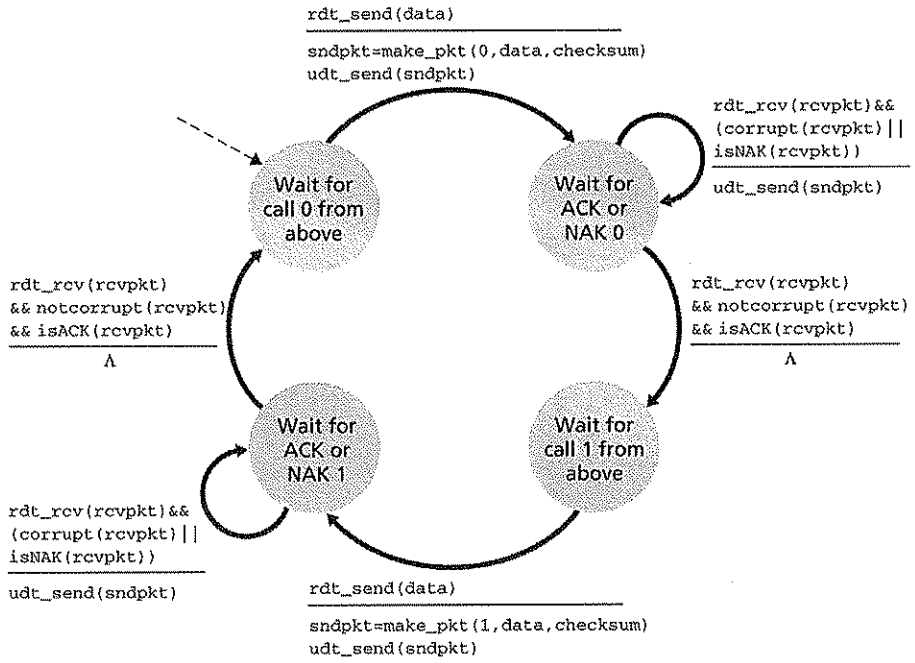
Write clearly. Explain your answers, if not told otherwise, and show all your steps in calculations. State any relevant assumptions that you make in addition to what is written in the question, but you are not allowed to change the question. Keep the same order on your answers as the questions in the exam. You can answer in either Swedish or English. Before you hand in the answers, make sure you also read the common instructions on the wrapper.

Good luck!

1. Protocols

a. The physical layer is considered as Layer 1 in the Internet protocol stack, as used in the course. Name the other four layers. Furthermore, name one protocol residing in each layer and also a typical network component where this protocol can be found. (3 p.)

b. Consider the following FSM for a sender. Assume that the network can corrupt as well as lose packets. Explain if this sender is able to avoid deadlocks in its data transmission or not. (2 p.)



2. Networking basics

a. True or false? With the selective-repeat sliding window protocol it is possible for the sender to receive an ACK for a packet that falls outside of its current window. Explain your answer. (1 p.)

b. True or false? With go-back-n it is possible for the sender to receive an ACK for a packet that falls outside of its current window. Explain your answer. (1 p.)

c. In a modern packet-switched network, the source host performs end-to-end message segmentation, i.e., it segments long, application-layer messages into smaller packets and sends the packets into the network. The receiver then reassembles the packets back into the original message. Consider a message, e.g. an image or a music file, that is 7.5×10^6 bits long that is to be sent from source to destination with two switches that the message has to pass through. Each link has a bandwidth of 1.5 Mbps. Ignore propagation, queueing and processing delays.

   i. Consider sending the message from source to destination without message segmentation. How long does it take for the message to reach the destination? (1 p.)

ii. Suppose the message is segmented into 5,000 packets. How long does it take for the second packet to be fully received at the second switch? (2 p.)

3. Applications

a. Explain what SMTP is used for and also how TCP is related to what SMTP does. (2 p.)

b. What is the main purpose of DNS services? (1 p.)

c. Calculate the time for an HTTP client to request and receive a web document from an HTTP server that contains two HTTP objects of 500 KB each. The round-trip delay is 10 ms and the bandwidth of the link is 10 Mbps. The TCP connection is persistent. (2 p.)

4. TCP

a. True or false? Assume host A is sending host B a large file over a TCP connection. Assume host B has data to send to host A. Host B can then piggyback the ACKs on data. Explain your answer. (1 p.)

b. True or false? The size of the TCP Receiver Window never changes throughout the duration of the connection. Explain your answer. (1 p.)

c. True or false? Assume host A is sending host B a large file over a TCP connection. If the sequence number for a segment of this connection is m then the sequence number for the subsequent segment will necessarily be $m+1$. Explain your answer. (1 p.)

d. Explain what a loss event is in the context of TCP congestion control. (2 p.)

5. IP

a. Explain how a receiving IP device can recognize that an incoming packet is an ARP request. (1 p.)

b. Explain what the normal response message sent by the DHCP server is, in response to a DHCPDISCOVER message sent from the client. (1 p.)

c. Assume an IP address has been assigned the subnet mask of 255.255.240.0. Assuming that the two most significant bits are reserved for other purposes, the remaining bits of the first two octets from the left can be used for addressing the network. Explain how many subnets that are possible to address and also how many hosts are possible per subnet. (3 p.)

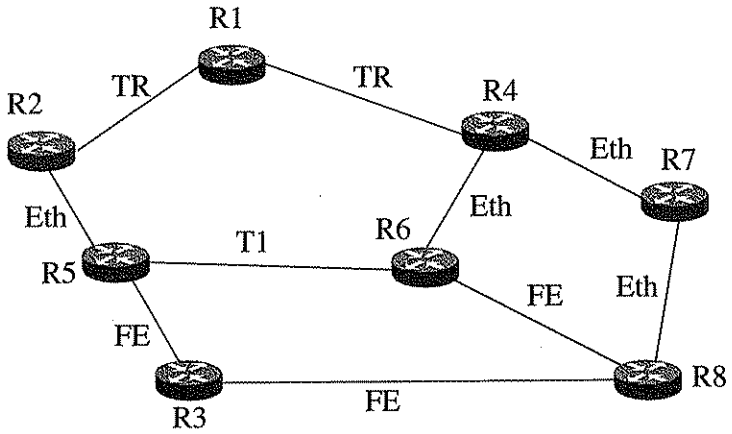
6. Routing

a. A router has the following routes in its forwarding table. A packet arrives at the router with a destination address of 10.0.4.1. Which interface will the router use to transmit the packet? (2 p.)

Route	Outgoing interface
0.0.0.0 /0	e1
10.0.0.0 /8	e0
10.0.0.0 /16	e1
10.0.1.0 /24	s0
10.1.1.0 /24	s1
10.1.0.0 /16	s0
10.1.0.0 /24	e1
10.1.1.1 /32	s2

b. Using the network listed below, which path is preferred by RIP from R6 to R2? Explain by describing the routes that will be advertised by R2 and each subsequent router along the different paths to R6. (1.5 p.)

T1 = Serial T1, cost 65
Eth = Ethernet, cost 10
TR = Token ring, cost 6
FE = Fast Ethernet, cost 1



c. Now assume that the network in b) above uses OSPF instead of RIP, explain which path would be preferred from R6 to R2?. (1.5 p)

7. LANs

a. Define what is meant by binary exponential backoff, as used by Ethernet. (1 p.)

b. Explain how many responses the sender of an ARP broadcast request can expect to receive. (1 p.)

c. Define the usage of the term hidden terminal. (1 p.)

b. Explain what probing is, as used in the context of an IEEE 802.11b LAN. (2 p.)

8. Network security

a. When a digital signature is created using public key encryption, which key is used to encrypt the signature? Explain your answer. (1 p.)

b. For each of the same four layers as in question 1 above, name one network security protocol that can be used each and also describe one of the many network-security service that each protocol can offer. (4 p.)