Uppsala University

Department of Information Technology

Distributed Information Systems (1DT066/1DT057)

2011-12-15 at 14-19

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Instructions to candidates:

- This is a **FIVE(5)** hour examination.
- Answer **ALL** questions in English.
- The total mark is 100.

Question 1

(a) Draw the Internet Protocol Stack and name each layer. [5 pts]
(b) Explain the principal responsibilities in each of these layers. [5 pts]

Question 2

(a) Name three services that TCP provides, but UDP does not provide. [6 pts]
(b) Give the *transport layer* protocol and *application layer* protocol for following applications. [4 pts]
   - File transfer
   - E-mail
   - Web documents
   - Video streaming

Question 3

(a) Explain two ways that a host obtains its IP address. [4 pts]
(b) The current version of the Internet Protocol (IP) is IPv4. Give two reasons that we need to move from IPv4 to IPv6. [6 pts]
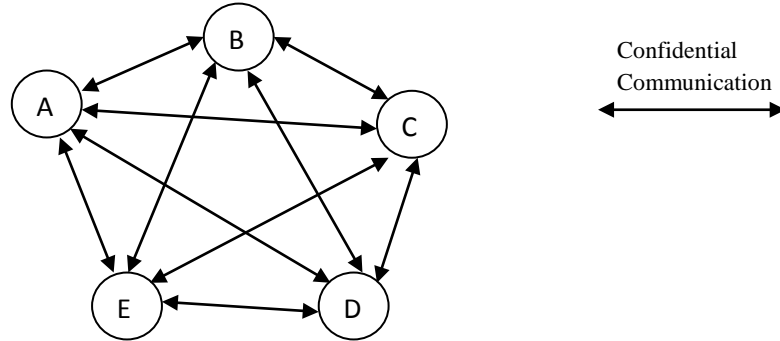

Question 4

(a) Explain the differences between peer-to-peer architecture and client-server architecture. [2 pts]
(b) Draw a diagram for each of the above two network architectures. [4 pts]
(c) Give an application as example for each of the above architectures. [4 pts]

Question 5

(a) Define the role of a firewall in computer networks. In defining the role of a firewall, you should discuss the techniques that a firewall uses at different levels to prevent external attacks on the network and control traffic flow through the firewall. [6 pts]
(b) Draw a diagram that shows where a firewall should be positioned with relation to protecting a local network. [4 pts]

Question 6

(a) Explain the difference between a symmetric key system and a public key system. [4 pts]

(b) There are 5 people, named A, B, C, D and E, in a network using symmetric key encryption. All communication between any two people is visible to all other people in the network, and no other person in this network should be able to decode their communication.


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How many keys are required in the system as a whole if symmetric key encryption is used? Now suppose that public key encryption is used. How many keys are required in this case? [6 pts]

Question 7

(a) Consider a subnet with prefix 201.101.101.64/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. [4 pts]

(b) Suppose an ISP owns the block of addresses of the form 101.101.128.0/17. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets? [6 pts]

Question 8

(a) What is the purpose of middleware? Name two examples of middleware. [4 pts]

(b) What is Network Time Protocol? [2 pts]

(c) Write the Vector Clock Timestamp for the following message exchanges. [4 pts]
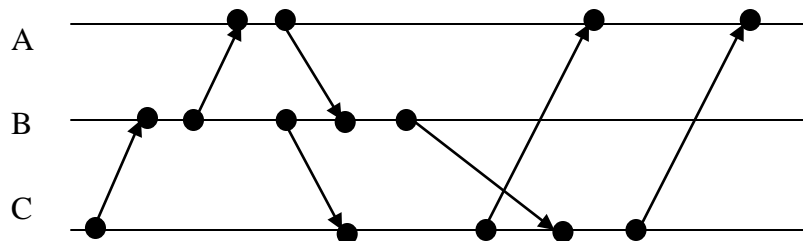
Question 9
  (a) Explain what serially equivalent means in transactions? [4 pts]
  (b) State and explain which of the following interleavings are serially equivalent? [6 pts]

T	U
Read (j)	
	Read(k)
	Write(i, 55)
Read(i)	
	Read(j)
	Write(k, 66)
Write(j, 44)	
Write(i, 33)	

Interleaving (1)

T	U
Read (j)	
Read(i)	
	Read(k)
Write(j, 44)	
Write(i, 33)	
	Write(i, 55)
	Read(j)
	Write(k, 66)

Interleaving (2)

T	U
Read (j)	
	Read(k)
	Write(i, 55)
Read(i)	
Write(j, 44)	
	Read(j)
	Write(k, 66)
Write(i, 33)	

Interleaving (3)

Question 10
Please choose one answer (A, B, C, or D) in each of the following questions.

(a) What is the name of the first packet-switching network? [2 pts]
        (A) Internet   (B) ARPANET   (C) Cyclades   (D) Telenet

(b) Which of the following applications is **NOT** built on a peer-to-peer model? [2 pts]
        (A) Skype   (B) BitTorrent   (C) Napster   (D) Web Service

(c) Which of the following services **CANNOT** be shared in cloud computing? [2 pts]
        (A) Softwares (B) Platforms   (C) Desktop Computers   (D) Servers

(d) Which of the following organizations is responsible for domain name allocation on the Internet? [2 pts]
        (A) ICANN   (B) ITU   (C) RFC   (D) IETF

(e) Which of the following services can handle the scope and scale of mobile and ubiquitous computing? [2 pts]
        (A) Time service (B) Discovery service (C) Debugging service (D) Recovering service

--- End of Paper ---

GODJUL! ☺ Merry Christmas!