DIE UNIVERSITEIT VAN STELLENBOSCH
DEPARTEMENT REKENAARWETENSKAP
RW354 - REKENAARNETWERKE

Examination November 2002
Time 3 hours. Full Marks 100

Instructions:

1. Answer all questions. Each question is worth 10 marks.
2. You may answer the questions in any order. Please ensure that each part of your answer clearly indicates the question that it answers.
3. You may not write in pencil or red.
4. Working notes on the left hand side of the page (the side not lineated) will not be marked. Should you wish such material to be considered, please indicate so clearly.
5. The marks accompanying each question indicate the relative volume required in the answer and the expected a mount of time to be spent in answering the question.

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1. Explain what is meant by and the difference between
   (a) Ethernet and CSMA/CD
   (b) FTP and TCP
   (c) ARP and IP
   (d) IP address and Ethernet address
   (e) LAN, MAN and WAN
   (f) time-division and frequency-division multiplexing
   (g) postal addressing scheme and network addressing scheme
   (h) DHCP and NAT.
2. Consider the network configuration of Figure 1 where TCP and UDP flows sent from the source nodes T_1 and U_1 share the bottleneck link (A, B) to send traffic to the destinations T_2 and U_2. Discuss
   (a) the service received by the two traffic flows: the throughput received at the destinations
   (b) if there is any difference between the service received by the two flows; explain why.

   Hint: to answer this question, you must consider the characteristics of these two type of flows.

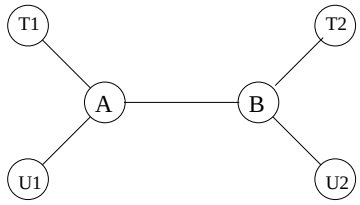
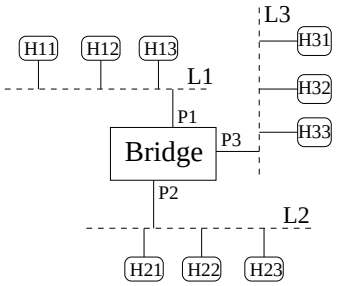


Figure 1. The Bottleneck Link model

3. Explain what is meant by and the principles behind
   (a) network protocols
   (b) network architecture: the layering model
   (c) OSI network architecture
   (d) TCP/IP network architecture
   (e) RSVP.
4. Explain what is meant by and the principle behind the following TCP concepts
   (a) additive increase/multiplicative decrease
   (b) two-way handshake
   (c) three-way handshake
   (d) slow-start
   (e) fast retransmit.
5. Consider the network configuration of Figure 2. Explain what is meant by and the principles behind the following LAN concepts



Px : Port x

Lx : LAN x ----

Hxy : Host y on LAN x

Figure 2. The LAN bridge environment

(a) a bridge

(b) the spanning tree algorithm.

6. Explain what is meant by and discuss the difference between the following routing concepts

   (a) source routing

   (b) circuit-switching

   (c) packet-switching

   (d) virtual path.

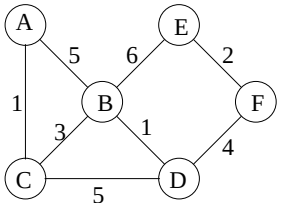


Figure 3. The network model

7. Consider the network configuration of Figure 3. Explain how the shortest paths from node A to other nodes are found and routing tables are filled using

   (a) OSPF

   (b) RIP.

8. At what level of the TCP/IP network architecture is network security?

9. Explain the principle behind and show the difference between

   - lossy and loss-less data compression
   - JPEG and MPEG

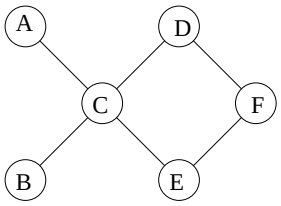


Figure 4. The fish network

   - DES and RSA.

10. Consider the network configuration of Figure 4. How many shortest paths from nodes A and B to F can be found using

    (a) OSPF

    (b) RIP

    (c) source routing.

    Justify your answer.