UNIVERSITY *of* LIMERICK

O L L S C O I L   L U I M N I G H

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

End-of-Semester Assessment Paper

Academic Year:	06/07	Semester:	Autumn
Module Title:	Telecommunication Networks Architectures	Module Code:	CS4218
Duration of Exam:	2½ Hours	Percent of Total Marks:	85
Lecturer(s):	Dr Seamus O'Shea	Paper marked out of :	100

Instructions to Candidates:

• Answer any THREE Questions

Q1

(a) Outline the features of the D channel in the ISDN BRA shared bus arrangement. Draw a diagram to show how the physical connection both between the connected TEs and the NT, and also between the NT and the ISDN network is realized. (8 marks)

(b) In what respects does LAPD on the D channel differ from the HDLC link protocol? Give plausible reasons for such differences. Draw a diagram to show the nodes at both ends of the data link over which LAPD operates in BRA. (9 marks)

(c) If an LAPD frame, of size 4096 bytes, is transferred from a TE to the local ISDN exchange at the UNI, how many physical layer frames will be involved in the actual transfer of the LAPD frame? (8 marks)

(d) In relation to (c) above, how long will it take to transfer the frame from TE to the local exchange? (8 marks)

Q2

(a) Draw a diagram to show the structure of a digital Time Switch Module. (TSM). Briefly explain how it operates. Distinguish between blocking and non blocking switches. (8 marks)

(b) Explain the role of Time Switch Modules and Space Switch Modules in the provision of flexible capacity in commercial switches. (8 marks)

(c) If a TSM is designed to switch as many as 16 PCM trunks, how many 64kbps channels in total does this correspond to? Assuming all channels are switched in parallel, what is the maximum time available to perform the switching operation? (8 marks)

(d) Suppose a multi-stage n x n switch has an n x k concentrator stage, a k x k cross bar stage and a k x n expansion stage. Under what traffic conditions is this type of switch appropriate? (k < n). (9 marks)

Q3.

An organization wishes to interconnect its mutually remote international LAN sites via the Internet and to implement a VPN.

Suppose that private disjoint IP addresses are in use at every site and that end user machines run the usual TCP/IP protocol stack, with the usual applications. In building the VPN, it is imperative that there is no impact on the end user machines. The VPN is to provide confidentiality and integrity of inter-LAN messages, and it is imperative that the source of each received message can be verified. At each LAN, a router serves as an access gateway to the Internet.

(a) Suggest how a secure VPN, to satisfy the above conditions, may be configured. (14 marks)
(b) Trace the passage of a message from an end user machine on one LAN to another end user machine at a different destination LAN, indicating the security related transformations which it is subjected to. (15 marks)
(c) How might end users become aware of the presence of the VPN? (5 marks)

Q4.

(a) Variable-size packets are used in X.25, IP, and FR, and fixed-size packets (cells) are used in ATM. Briefly explain the reason for such differences, and set out the advantages and disadvantages of fixed-size packets. (7 marks)
(b) Describe the delays that an end user message (e.g an IP packet) may experience as it traverses an ATM network from ingress to egress node. What is approximately the maximum overall acceptable latency for voice traffic? (without echo cancellers) (7 marks)
(c) Differentiate between a switch and a cross-connect, and suggest where each type of node may be deployed in modern transport networks. (9 marks)
(d) What are the characteristics of self similar network traffic? What types of end user traffic may give rise to self-similar traffic profiles within transport networks? (10 marks)

Q5

(a) Outline the security-related threats which an Internet-accessible server may be exposed to. Give examples of appropriate defences to counter such threats. (6 marks)
(b) Give examples of how a 'non repudiation' service may be useful in the context of e-business and suggest how such a service may be implemented. (5 marks)
(c) How could a client verify that a web server it logs onto, and proposes to do business with, is not a fake server? How can the client verify that messages it exchanges with the server have not been modified in transit over the intervening network? (5marks)
(d) Draw a diagram to show the location of the SSL layer in the protocol stack. What role does the TLS Record layer play in providing SSL services? (6 marks)
(e) Explain how the AH protocol of IPSec provides assurance to the receiver regarding both the origin and integrity of a packet. (5 marks)
(f) Both IPSec and SSL provide for the integrity of messages. Comment on the differences between them. (6 marks)