



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:	2006/2007	Semester:	Spring
Module Title:	Telecommunication Networks Architectures	Module Code:	CS4228
Duration of Exam:	2½ Hours	Percent of Total Marks:	85
Lecturer(s):	Dr Séamus O'Shea	Paper marked out of :	100

Instructions to Candidates:

Answer any 3 questions.

Q1.

- (a) Draw a diagram to show the relationship between TCAP, users of TCAP, and the rest of the SS7 protocol stack. (8 marks)
- (b) Describe the services which TCAP provides, and give examples of typical uses in INAP, GSM and OMAP. (8 marks)
- (c) In the context of international roaming where a foreign node interacts with a home node, state how incompatibilities between different TCAP versions may be surmounted. (9 marks)
- (d) Draw a diagram to show the structure of a TCAP message. What TCAP function call is used to specify an operation that is to be performed at a remote node? How is the precise operation specified? (8 marks)

Q2.

- (a) What additional new signalling services had to be provided in the SS7 system to accommodate digital mobile networks? (Take GSM as an example). (8 marks)
- (b) Describe the role of databases in support of both mobile and intelligent network services. Give examples. Allude to the services of SCCP in relation to database access. (8 marks)
- (c) What are the benefits of Global Title (GT) addressing as opposed to Point Code (PC) addressing in SS7? Explain how GT addresses are resolved to PC addresses in the course of transporting an SCCP message between a pair of interacting nodes. Allude to other similar mechanisms known to you. (9 marks)
- (d) Give examples of the type of users for which a connection oriented transport service in SCCP may be beneficial and state why. (8 marks)

Q3

- (a) Compare the GSM speech encoding mechanism with that in fixed networks. (6 marks)
- (b) When GSM encoded speech has to be transported over fixed networks describe the interoperability issues that arise and discuss how they are handled. (7 marks)
- (c) Draw a diagram to show the contents of a normal transmission burst from an MS in GSM. Briefly explain the purpose of each field. How many bursts are required to transmit 20 msec worth of interleaved speech? (7 marks)
- (d) What is the purpose of the training sequence in each transmitted burst? Draw a diagram to show how Rayleigh fading affects a wireless channel. (7 marks)
- (e) In GSM, what is the advantage of interleaving the speech from several 20msec intervals? (6 marks)

Q4.

- (a) Outline the main design objectives of IPv6. Draw a diagram to show the structure of the IPv6 Base Header. What are the advantages of a fixed size Base Header? (6 marks)
- (b) Give examples of other protocols in the TCP/IP stack that are affected by the introduction of IPv6, and explain briefly what the affect is in each case. (7 marks)
- (c) How are 'options' provided for in IPv6? Give some examples of currently defined options, and indicate how new as-yet-undefined options could be integrated into IPv6. (7 marks)
- (d) Give examples of interoperability issues that arise in the deployment of IPv6. Briefly discuss how such issues may be approached. (7 marks)
- (e) Briefly outline the IPv6 support for real time services. (6 marks)

Q5.

- (a) What are the characteristics of an 'ad hoc' wireless networks? What are the advantages/disadvantages when compared to infrastructure-based wireless networks? (6 marks)
- (b) What are the hazards of the unlicensed ISM band that Bluetooth has to cope with, and briefly explain how Bluetooth is designed to counteract such hazards. (7 marks)
- (c) Explain how a capacity advantage is gained in a cellular network. Allude to GSM and DECT to support your answer. (7 marks)
- (d) In a TDMA based wireless network, the presence of multiple signals at the receiver, each having traversed a different path, causes problems. Discuss how such problems can be alleviated. (8 marks)
- (e) Distinguish between scattered and diffracted radio signals. Give examples of how such signals can sometimes be beneficial in providing coverage. (6 marks)