UNIVERSITY *of* LIMERICK

OLLSCOIL LUIMNIGH

COLLEGE *of* INFORMATICS *and* ELECTRONICS

Department of Computer Science
and Information Systems

End-of-Semester Assessment Paper

Academic Year:	2005/2006	Semester:	Summer
Module Title:	Telecommunication Networks Architectures	Module Code:	CS4228
Duration of Exam:	2½ Hours	Percent of Total Marks:	100
Lecturer(s):	Dr Séamus O'Shea	Paper marked out of :	100

Instructions to Candidates:

Answer any 3 questions.

Q1.

(a) Briefly outline the main functions performed by an STP in an SS7 network and give examples of typical configurations within the SS7 network where an STP is deployed. (11 marks)

(b) Outline the functions performed at level 3 of the SS7 signalling stack. In processing a received message, how does a signalling node decide whether a message requires further onward switching to its ultimate destination, or is to be distributed within the node? In the case of internal distribution, how does the node decide which process should receive the contents of the SIF field? (11 marks)

(c) Give examples of signalling scenarios where SCCP together with TCAP are deployed and in each case explain the role of both SCCP and TCAP? (11 marks)

Q2.

(a) Compare the speech encoding mechanism used in the fixed telephone network and in GSM digital networks. When GSM encoded speech has to traverse the fixed network, a conversion to the fixed network's encoding takes place. Discuss the options as regards where such conversion should take place. (11 marks)

(b) Mobile users can be variable distances from the BTS with which they communicate. What implication does this have regarding the power output of the MS and the synchronization between the MS and the BTS. How are those effects addressed in GSM? (11 marks)

(c) Discuss the problems that arise when multiple signals arrive at an MS/BTS each having travelled over different paths. How can such problems be alleviated? (11 marks)

Q3.

(a) What additional services, in addition to those of MTP, does SCCP provide in the SS7 system? Give examples of users of those additional services. (10 marks)

(b) How does Global Title (GT) addressing differ from Point Code addressing in SS7? Describe the kind of information that is encoded in each address type, and give examples of where each type may be typically used. (10 marks)

(c) Discuss the role of both SCCP and TCAP in the interaction between an MSC/VLR and a user's HLR in the process of retrieving the user's profile for authentication purposes. In the case where the HLR and the MSC/VLR are in different countries, (i.e international roaming) describe how Global Title addressing is used to generate routing labels at intermediate nodes between the MSC/VLR and the HLR. (13 marks)

Q4.

(a) In the context of the transport of multi-media content over the Internet, give examples of applications which are delay-sensitive and loss-tolerant. Also give examples of applications which are loss-sensitive and delay-tolerant. (10 marks)

(b) What compensating mechanisms can be used to counteract the defects of 'best effort' transport as regards delay-sensitive applications? Refer especially to the role of RTP in the transport of audio/video content over the Internet and compare its role to that of AAL in ATM. (11 marks)

(c) Compare the approaches of 'Intserv' and 'Diffserv' regarding the provision of QoS in the developing Internet. (12 marks).

Q5.

(a) Give examples of the kind of data that is stored on the SIM card within the MS, and for each explain how that data is used by the network. When the MS is used in a foreign PLMN, how does the serving PLMN discover the HLR of the visiting MS? (11 marks)

(b) Explain what a 'location area' is. Describe the advantages of keeping location-related data for each MS on a cell basis rather than on a location area basis. What are the disadvantages?. Draw a diagram to show the exchange of signalling messages to effect a location area update (triggered by the MS). Indicate the signalling channels used. (11 marks)

(c) Suppose an O_2-registered business-man, normally resident in Limerick, goes to Rome on a business trip. On arrival in Rome, he makes a mobile call to arrange a Taxi. While in Rome, a friend, in Limerick, dials the business-man's mobile number using a fixed telephone. Describe the major steps involved in connecting the friend's call, making special reference to how the location of the called party is established. (12 marks)