



# 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:	2007/2008	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.

- What reliability requirements attach to the SS7 network? Show how the reliability requirements are satisfied both at the physical level and also at the protocol levels? (8 marks)
- 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 may be deployed. (8 marks)
- 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? (8 marks)
- Draw a diagram to show the main fields within the routing label of an MSU. In the context of international signalling where GT addressing is used to specify the source and destination nodes at the SCCP level, give examples of how address resolution is necessary to generate appropriate routing labels corresponding to the intermediate nodes along the route. (9 marks)

#### Q2.

- Draw a diagram to show the relationship between the main network nodes that implement a GSM PLMN. Show also the main interfaces which are defined. (5 marks)
- Describe how a serving GSM PLMN discovers the location/identity of a visiting user's HLR. In the case where service is provided by several service providers in the visited area, discuss how the final selection is made by the MS. (5 marks)
- What is the role of the SIM card in the authentication of an MS? (5 marks)
- How does an MS discover that a location area update is necessary? Give an example of a situation where the network directs an MS to perform a location area update. (5 marks)
- Draw a diagram to show the exchange of signalling that takes place in the handover of an MS where both the old and new BTSs are controlled by the same BSC. (6 marks)
- Describe the purpose of the SACCH channel in GSM (7 marks)

**Q3.**

- (a) Compare the 'best effort' service of traditional IP with the 'Diffserv' approach to QoS provision in the developing Internet. If a 'best effort' router is to be converted to a 'Diffserv' router, describe the changes that have to be made. (5 marks)
- (b) Outline some of the measures that can be taken, on an end-to-end basis, to alleviate the effects of 'best effort' transport of streamed audio or video material. (6 marks)
- (c) How does Weighted Fair Queueing (WFQ) router scheduling differ from the traditional FIFO discipline? (6 marks)
- (d) What is the role of RSVP in implementing both 'Intserv' and 'Diffserv' QoS in IP networks? (6 marks)
- (e) Give an example of a situation where content to be streamed may originate at several sources, and may have to be delivered to several receivers. Describe the role of RSVP in this type of situation. (6 marks)
- (f) Give examples of how a 'leaky bucket' algorithm can be used in the provision of QoS. (5 marks)

**Q4.**

- (a) What were the driving forces responsible for the introduction of IPv6? (3 marks)
- (b) Compare the base header fields of an IPv6 packet with the default (no options) packet header of IPv4. (4 marks)
- (c) How are 'options' catered for in IPv6? Suppose a new option is defined. How can it be introduced? (4 marks)
- (d) What is the purpose of the routing header extension? What are the fields of this extension header? Briefly explain how a packet is handled by routers from source to destination over the prescribed path. (5 marks)
- (e) If an IPv6 packet is too large for a router to forward, how is it handled? (5 marks)
- (f) Give examples of how ICMP is affected by the introduction of IPv6. (6 marks)
- (g) Give an example of how 'tunnelling' can be useful in achieving interoperability between the different versions of IP. (6 marks)

**Q5.**

- (a) Briefly describe the communication features of the ISM 2.4GHz band. (4 marks)
- (b) Explain the term 'ad-hoc' networking with particular reference to Bluetooth and Wireless LANs. Compare the characteristics of a Bluetooth piconet and an 802.11 WLAN cell. (5 marks)
- (c) Describe how access to the radio medium is handled in Bluetooth and compare with other radio based networks. (6 marks)
- (d) What are the advantages of the frequency hopping mode of operation at the Bluetooth Baseband level? How many radio channels are available for hopping and what is the hop rate? How is the hopping sequence agreed between the master and a slave? (5 marks)
- (e) Is it possible for several Bluetooth piconets to exist in the same room? Explain. (5 marks)
- (f) Explain how Time Division Duplex (TDD) communication is used between the master and a slave in a piconet. What options are available to a Bluetooth node in terms of achieving variable data rates over an ACL? Which channel types give the highest data rates? (8 marks)