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:	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) 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)
(b) Draw a diagram to show the structure of a Message Signal Unit (MSU) in SS7. Differentiate between the various message types in SS7, and state how the type of a message is established.
                                                                                                      (8 marks)
(c) Give examples of events which would cause the receiver of an SS7 message, at the signalling link layer, to request a retransmission. How is the request for retransmission indicated to the sender? How does the receiver distinguish a retransmitted message from the original? Discuss the impact of propagation delay between sender and receiver on the recovery strategy.   (8 marks)
(d) 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.
(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.   (8 marks)
(b) Draw a diagram to show the structure of a normal transmission burst from an MS in GSM. Briefly explain the contents of each field. How many bursts are required to transmit 20 msec worth of interleaved speech?   (8 marks)
(c) 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?   (9 marks)
(d) 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?   (8 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? (5 marks)
    (b) How are 'options' catered for in IPv6? Suppose a new option is defined. How can it be introduced? (5 marks)
    (c) 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)
    (d) What special features does IPv6 provide for voice and video based services? (5 marks)
    (e) Discuss the security-related services of IPv6 and compare with those of IPv4 (6 marks)
    (f) Give examples of how ICMP is affected by the introduction of IPv6. (7 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)