



# UNIVERSITY of LIMERICK

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

COLLEGE of Science and Engineering

Department of Computer Science  
and Information Systems

## End-of-Semester Assessment Paper

Academic Year:	<b>2008/09</b>	Semester:	<b>Spring</b>
Module Title:	<b>Computer Networks &amp; Data Communications</b>	Module Code:	<b>CS4225/CS5222</b>
Duration of Exam:	<b>2½ Hours</b>	Percent of Total Marks:	<b>75</b>
Lecturer(s):	<b>Dr Séamus O'Shea</b>	Paper marked out of :	<b>100</b>

### Instructions to Candidates:

### Answer 3 Questions

#### Q1.

- (a) Differentiate between the transmission speed and the propagation speed on a physical network link. (4 marks)
- (b) If the transmission speed on a link is 10 Mbps, what is the bit time? (5 marks)
- (c) If the propagation speed on a link is taken to be 200 m/μsec, what distance separates the leading and trailing edges of a pulse which represents a single binary digit when the transmission rate is 10Mbps? How many bits will fit on a 100 km length link? (8 marks)
- (d) If a data signal suffers attenuation of 5dB in travelling over a link, what fraction of the original power is the final power? (4 marks).
- (e) How long will the transmission of a 32KB file take on a 64 kbps link.? (4 marks)
- (f) Compare the features of Ethernet hubs and Ethernet switches (8 marks)

#### Q2.

- (a) Suppose you are a network manager and you have been allocated the address block 136.11.32.0 with a corresponding mask of 255.255.240.0. How many valid addresses are in this block? (5 marks)
- (b) Suppose you wish to create 6 equal sized subnets using this block, to be interconnected via a 'classful' router. How many valid addresses will be available in each subnet? (5 marks)
- (c) What will be the appropriate mask for each subnet? (6 marks)
- (d) List the first 3 address blocks in dot decimal notation. (6 marks)
- (e) What are the starting and final addresses in the first block? (6 marks)
- (f) What is the broadcast address on the subnet 136.11.36.0? (5 marks)

**Q3.**

- (a) What are the primary issues that data link protocols are concerned with? (5 marks)
- (b) Explain what the terms 'error control' and 'flow control' mean and give examples of how each may be achieved in the context of data link protocols. (5 marks)
- (c) What link characteristics would suggest the use of a 'selective repeat' type of protocol as opposed to a 'go back n' type of protocol? (6 marks)
- (d) Suppose a link is very prone to random errors which occur independently of each other. To increase the transmission reliability, the sender and receiver agree on a code. According to the agreed code, to transmit a binary '1', the codeword '111' is transmitted, and to transmit a binary '0' the codeword '000' is transmitted. The receiver takes the three received bits and decides which bit was sent by taking a majority vote of the three bits. If 'p' is the probability of a single bit error within a codeword, what is the probability that a codeword will be received in error? (12 marks)
- (e) In relation to (d) above, if 'p' = 0.001, calculate the probability of codeword error. (6 marks)

**Q4.**

- (a) Which of the address blocks, 112.15.96.0/19 and 112.15.96.0/21, is the smaller? How many of the smaller blocks are contained in the larger block? (4 marks)
- (b) A user's PC has an IP address of 192.168.6.3/26 and a default gateway configuration of 192.168.6.65/26. Examine if the default gateway is properly configured to allow access to remote networks. (7 marks)
- (c) Suppose you have 20 PCs plus a router connected into the same Ethernet hub. Suppose that you wish to arrange the PCs into 5 separate interconnected networks of the same size at the IP level, using addresses from the block 192.168.9.0/24. Show how this could be done, assuming CIDR addressing policy. (7 marks)
- (d) Briefly describe the services that TCP provides in the TCP/IP protocol stack? (5 marks)
- (e) How are message retransmissions triggered in TCP? (5 marks)
- (f) What are the consequences if the TCP retransmission timer is (i) too short? (ii) too long? (5 marks)

**Q5**

- (a) Consider a packet switched network. Given that messages have to be segmented into packets at the source, and have to be reassembled at the destination, what is the worthwhile advantage of packet switching? (5 marks)
- (b) Under what circumstances may 'small' packets be more advantageous than 'large' packets? Which would be more appropriate for streaming audio/video distribution? Why? (7 marks)
- (c) Give examples of higher layer protocols which use IP to deliver their messages. (5 marks)
- (d) When a received packet is processed by IP, how does it decide which higher layer protocol should receive the packet's payload? (5 marks)
- (e) Give examples of higher layer protocols which use the services of TCP. (5 marks)
- (f) When TCP is processing a received message, how does it decide what higher layer protocol should receive the message's payload? (6 marks)

