

OLLSCOIL NA hEIREANN, CORCAIGH
THE NATIONAL UNIVERSITY OF IRELAND, CORK

COLAISTE NA hOLLSCOILE, CORCAIGH
UNIVERSITY COLLEGE, CORK

Summer Examination 2007
Second Science

Computer Science
CS2204 – Network Computing

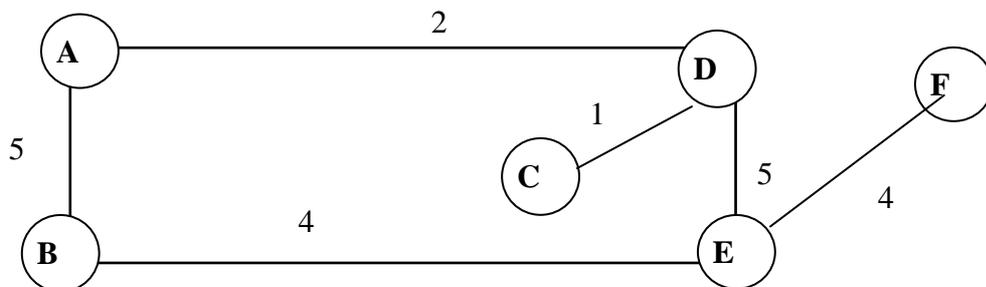
Professor S. Craw
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You may use a calculator.
Attempt all 3 questions.

Time allowed: 3 hours

Question 1: Packet Switching [50 marks]

- a) Explain the technical benefits and limitations of bridge-based networks (extended LANs). [10 marks].
What is the purpose of executing the spanning-tree algorithm in such a network? [5 marks]
- b) Define the datagram and virtual circuit switching approaches. [3 marks]
Compare them using the following three headings. Please keep your comments brief and concise.
- 1) Differences in communication delay. [4 marks]
 - 2) Impact of link/router failures. [4 marks]
 - 3) Overhead data in each packet. [4 marks]
- c) What well-known algorithm forms the basis for Link State Routing? [3 marks]
For the network shown in the diagram below, clearly show how node B uses the Link State algorithm to populate its shortest path routing table (*Hint: using a Tentative list and a Confirmed list*). [7 marks]



- d) Using diagrams, briefly describe the following three types of local area network (LAN) topology: bus, ring, star. [6 marks]
 Imagine a company seeks your advice on which topology is most suitable for their needs. Explain which factors you would consider in making your recommendation? (Hint: think about issues such as installation/extensibility and resiliency). [4 marks]

Question 2: Internetworking [50 marks]

- a) Expand the acronym DHCP and state briefly the purpose of using DHCP. [5 marks]
 Explain the difference between static and dynamic allocation of addresses by a DHCP server. [10 marks]
- b) The figure below shows the IPv4 header (without options). Briefly explain the function of each field. [11 marks]
 Comment on the significance of the size of the “Length” field. [4 marks]

0	4	8	16	19	31
Version	Hlen	TOS	Length		
Ident			Flags	Offset	
TTL		Protocol	Checksum		
SourceAddress					
DestinationAddress					

- c) Using an example, explain the motivation for using classless IP addressing instead of class-based IP addressing. [4 marks]
 Explain the a.b.c.d/x syntax for classless addressing. [3 marks]
 Assuming that x equals 24, how many unique *hosts* can be identified using this address? [3 marks]
- d) As the Internet has evolved, new protocols and techniques have been devised to cope with new challenges and opportunities. Three such developments are:
- 1) IP version 6 (IPv6)
 - 2) Virtual Private Networks (VPNs)
 - 3) Network Address Translation (NAT)
- Select one of these topics, then (a) explain the nature of the issues it addresses [3 marks], (b) describe the salient features of its design and operation [3 marks], and (c) make some observations about its design or deployment [4 marks].

Question 3: End-to-End Protocols [40 marks]

- a) Draw a TCP/IP internet that consists of a bus-style Ethernet network and a token-ring network connected by a router. Show a computer attached to each network. Assume one computer runs a web server and the other runs a web browser. [5 marks]
Show the protocol stacks used on both the computers [5 marks] and the protocol stack used on the router [5 marks].
- b) TCP is a reliable transport protocol. It achieves reliability by using a sliding-window protocol. Briefly explain how TCP's sliding window protocols operates. Be sure to identify which fields in the TCP header are used for sliding window. [5 marks]
- 1) Consider two hosts, A and B, with an open TCP session. A sends a segment with sequence number 120 and after some time receives a segment from B with sequence number 800 and acknowledgment number 140. How many bytes were received and confirmed by host B? What is the meaning of 800? [5 marks]
 - 2) If B receives two segments from A with no errors, the first with sequence number 120, and the second with sequence number 220, and each carries 50 bytes, what will be the acknowledgment number sent by B to A? [5 marks]
- c) Explain the 5 aspects of network management defined in the ISO Network Management Model. [5 marks]
Define the terms SNMP and MIB and explain their use in Internet network management. [5 marks]