



THE UNIVERSITY OF  
**WAIKATO**  
*Te Whare Wānanga o Waikato*

## 2008 A SEMESTER EXAMINATIONS

DEPARTMENT	Computer Science
PAPER TITLE	Communications and Systems Software
TIME ALLOWED	Three Hours
NUMBER OF QUESTIONS IN PAPER	Five
NUMBER OF QUESTIONS TO BE ANSWERED	Five
VALUE OF EACH QUESTION	All questions are of equal value.
GENERAL INSTRUCTIONS	Answer ALL FIVE questions.
SPECIAL INSTRUCTIONS	Nil
CALCULATORS PERMITTED	Yes, non programmable calculators

TURN OVER

## 1. Link Layer Protocols

- (a) What is the difference between FDMA and OFDMA?  
(2 marks)
- (b) Given that 802.11b does not use CDMA, why does it use DSSS?  
(2 marks)
- (c) In wireless networking what is the hidden node problem (sometimes called the hidden terminal problem)?  
(2 marks)
- (d) What is CSMA/CD? Why do CSMA/CD protocols, such as Ethernet, employ exponential back-off? Why does “fast” Ethernet not use CSMA/CD?  
(6 marks)
- (e) What is forward error correction?  
(2 marks)
- (f) Using an example, explain how block codes work in forward error correction.  
(6 marks)

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## 2. Local Area Networks

- (a) What is the difference between a switch, a hub and a bridge? Your answer should include discussion on the contention and broadcast domains associated with each of these. (5 marks)

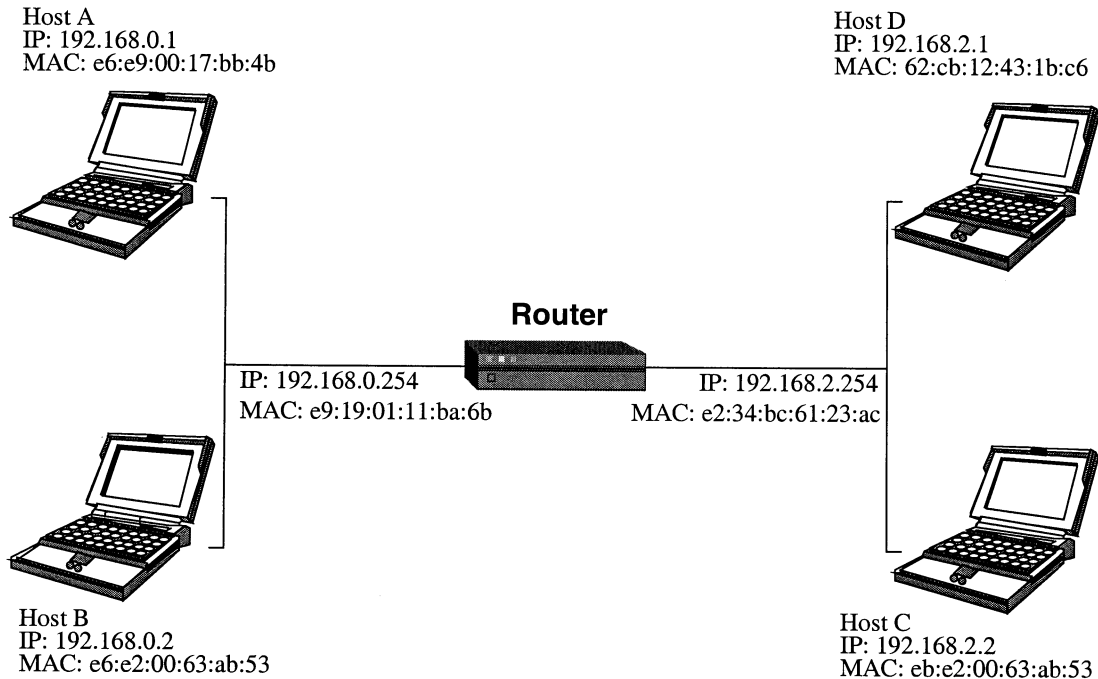


Figure 1: Network Diagram for Question 2b.

- (b) Consider two LANs interconnected by a router as shown in Figure 1.
- Enumerate all of the steps required to send an IP datagram from host A to host C assuming that the ARP tables in the host A and the router are up to date.
  - Enumerate all of the steps required to send an IP datagram from host B to host C assuming that the ARP table in host B is empty and the ARP table in the router is up to date.
- (6 marks)
- (c) What is the purpose of the ethertype field in an Ethernet II header? (2 marks)
- (d) The 802.1p and 802.1q standards describe the use of additional fields in the Ethernet header. What are these fields, and what are they used for? (4 marks)
- (e) What is the purpose of the Spanning Tree Protocol (STP)? What drawbacks does this approach to the problem have? (3 marks)

TURN OVER

### 3. Internet Protocol

- (a) The host 130.217.129.42 is on a subnet with a 20-bit subnet mask.
- (i) Write the subnet mask using dotted decimal notation.
  - (ii) Write down the reserved addresses on this subnet.
  - (iii) What are the reserved addresses used for?
  - (iv) How many host addresses are available on this subnet?
- (4 marks)
- (b) What type of IPv4 address is 192.168.42.127/25? Note: two answers required.
- (2 marks)
- (c) Describe the use of the Identifier field in an IPv4 header.
- (4 marks)
- (d) What is the main difference in the way fragmentation is handled between IPv4 and IPv6?
- (2 marks)
- (e) What source and destination IP addresses are used in the DHCP discover packet sent when a client starts up?
- (3 marks)
- (f) The largest payload an ICMP “ping” packet can carry is often 1472 bytes. Why this number? If the ping packet is to be carried over the same set of links using an IP-in-IP tunnel, what number will apply instead of 1472?
- (5 marks)

#### 4. Routing

- (a) A RIPv2 Response packet contains a routing domain, a route tag, an address family identifier and what four other items of information about each route?  
(3 marks)
- (b) What is the primary difference between OSPFv2 and OSPFv3?  
(1 mark)
- (c) Must BGP peers inside a single AS be near to each other in network terms? Why?  
(2 marks)
- (d) In order from most to least significant, what are four criteria a router will use in choosing between two routes both received by BGP?  
(3 marks)

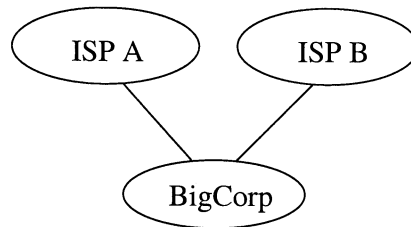


Figure 2: Network Diagram for Question 4e.

- (e) Figure 2 shows BigCorp receiving Internet service from two service providers.
  - (i) What name is given to this arrangement?  
(1 mark)
  - (ii) Is 65500 a suitable AS number for BigCorp to use? Why?  
(1 mark)
  - (iii) What type of address space must BigCorp advertise?  
(1 mark)
  - (iv) At a minimum, what routing policy must be applied to routes advertised by BigCorp to ISP A?  
(2 marks)
- (f) What is the minimum group of aggregate routes that will cover all of the following routes and no others?
  - (i) 59.64.0.0/20
  - (ii) 59.64.8.0/22
  - (iii) 59.64.16.0/21
  - (iv) 59.64.20.0/22
  - (v) 59.64.24.0/21
  - (vi) 59.64.32.0/19
  - (vii) 59.64.64.0/20
  - (viii) 59.64.80.0/20

(6 marks)

TURN OVER

## 5. Internet Applications and the Transport Layer

- (a) Name four DNS record types. For each, describe the information contained in the record.  
(4 marks)
- (b) Both DNS and HTTP protocols are designed to support individual transactions. Explain why DNS uses UDP while HTTP uses TCP.  
(4 marks)
- (c) Explain the function of each of the fields in the TCP header.  
(12 marks)