Midterm Examination: Semester 1   **Academic Year:** 2002-2003

Date: July 31, 2002   **Time:** 13:30 - 16:30

Subject Number: 240-574   **Room:** 201

Subject Title: Special Topics Information Network Engineering I
                  (Internet and its Protocols)

Exam Duration: 3 hours

This paper has 3 pages (including this page).

Authorised Materials:

- Anything the student can carry.

Instructions to Students:

- *Answer questions in English.* Good English is **not** required.

- Attempt all questions

- Write answers in an answer book

- Start the answer to each question on a new page.

- **Clearly Number** the answers. It is **not** required that questions be answered in order.

- Anything illegible is incorrect.

- Show all calculations, not just the final result.

- Answer briefly where possible, essays are not required.

- The marks allocated for each question are shown next to that question. There are 30 marks total for this examination.

Question 1.   *(3 marks)*

Which of the following statements concerning the Address Resolution Protocol (ARP) is not correct (that is, which are false).

Note: There might be more than one, the answer should list all incorrect statements. You need only supply the identifier (A, B, C, ...) of the incorrect statements, however a brief explanation of why the statement is incorrect might sometimes help.

A)   ARP can be used to locate an ethernet address to use to reach a known IP address.

B)   Because ARP is not an IP based protocol, it works only over ethernet.

C)   ARP packets for IP on an ethernet always contain extra padding bytes.

D)   ARP cannot be used for anything other than IP version 4.

E)   ARP was replaced by Neighbour Discovery in IPv6, because Neighbour Discovery runs over the IP layer, and so can be routed from one link to another.

F)   ARP can be used to locate the IP address allocated to a particular ethernet address.

Question 2.   *(4 marks)*

In what circumstances (if any) might IPv6's Duplicate Address Detection fail to detect a duplicate address. How can this happen, or what prevents duplicate addresses from ever existing?

Question 3.   *(2 marks)*

Why should an ICMP packet indicating a packet error, or forwarding problem, not be transmitted if the packet experiencing the problem is an ICMP error message packet?

**Question 4.**   *(3 marks)*

Explain an alternative method that might be used instead of the use of **Well Known** port numbers for transport connection identification.

Question 5.   *(5 marks)*

If there are three routers on a link, each sending IPv6 router advertisement packets, how will an end-node connected to a link choose which router it should use? Does it matter? Why or why not?

Question 6.   *(8 marks)*

A)   Examine the network in the diagram
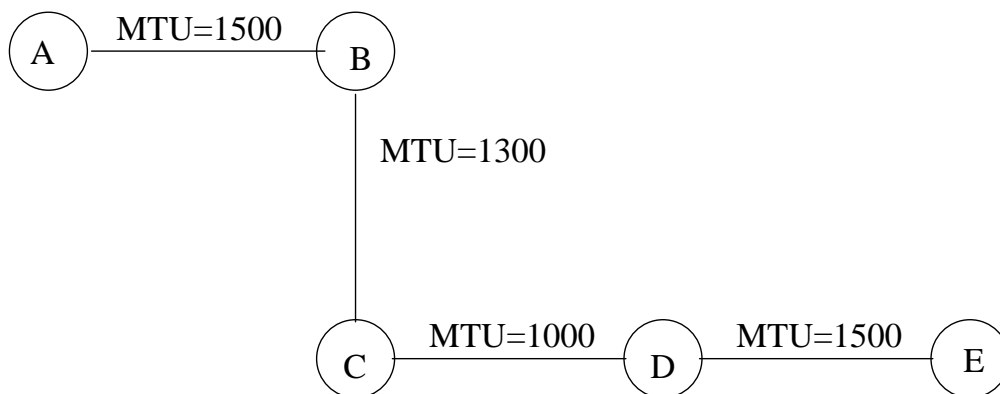
If node A desires to send an IP packet to node E, that is 4000 bytes large (total IP packet size), show the packet(s) that will arrive at E, assuming that Path MTU Discovery is not in use. Do not assume that nodes have knowledge of the MTU on links to which they are not directly connected.

Indicate at which node(s) fragmentation would have occurred.

B)   Using the same diagram, and the same original packet from A to E, indicate what packet(s) would arrive if Path MTU discovery is in use.

Question 7.   *(2 marks)*

What does the UDP protocol add to the protocol stack that is not already provided by the IP protocol, over which UDP runs?

Question 8.   *(3 marks)*

Give 3 uses of the TCP sequence number.

Show how the sequence number is used to achieve each of those purposes.