

THE UNIVERSITY OF BRITISH COLUMBIA
Computer Science 317, Section 201
Quiz 1
January 29, 2015

Instructor: Norm Hutchinson

Time: 30 minutes

Total marks: 27

First Name (printed): _____ Last Name:(printed)_____ Student No: _____

Signature: _____

This quiz consists of 5 pages (including this cover page). When instructed to do so, verify that you have a complete quiz.

This is a closed book quiz. Notes, books, electronic devices or aids, or other materials are not allowed.

Answer all the questions on this paper. Use the backs of pages if you need more space. Be sure to indicate that an answer is being continued on the back of a page. Give short but precise answers. Always use point form where appropriate. Marks will be deducted for answers that ramble, repeat information, or contain information not relevant to the question.

The marks for each question are given to the left of each question. Use this to manage your time.

READ AND OBSERVE THE FOLLOWING RULES GOVERNING EXAMINATIONS:

1. Each candidate must be prepared to produce, upon request, a UBCcard for identification;
2. Candidates are not permitted to ask questions of the invigilators, except in cases of supposed errors or ambiguities in examination questions.
3. No candidate shall be permitted to enter the examination room after the expiration of one-half hour from the scheduled starting time, or to leave during the first half hour of the examination.
4. Candidates suspected of any of the following, or similar, dishonest practices shall be immediately dismissed from the examination and shall be liable to disciplinary action:
 - Having at the place of writing any books, papers, calculators, computers, sound or image players/recorders/transmitters (including telephones), or other memory aid devices, other than those authorized by the examiners;
 - Speaking or communicating with other candidates;
 - Purposely exposing written papers to the view of other candidates or imaging devices. The plea of accident or forgetfulness shall not be received.
5. Candidates must not destroy or mutilate any examination material; must hand in all examination papers; and must not take any examination material from the examination room without permission of the invigilator.
6. Candidates must follow any additional examination rules or directions communicated by the instructor or invigilator.

Additional Rules and Directions:

You are *not permitted to ask questions* of the invigilators during the exam. If you are unsure of a question state your assumptions and answer the question to the best of your ability.

Marks	
1.	/6
2.	/7
3.	/5
4.	/8
Total	/27

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a place of mind
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Name:

Student No:

6 1) Short Answers {2 marks per question} Answer each question with at most one or two sentences. Be as brief and as clear as possible, while making sure the answer is properly justified.

a) What is the purpose of DHCP. Does every machine on the Internet use DHCP?

DHCP is a protocol used to acquire an IP address when a machine is attached to a network. No, every machine on the Internet doesn't use DHCP. There has to be at least one machine that doesn't use DHCP and has a hard coded address. (If such a machine didn't exist where would the first machine get its address from?)

b) A packet header contains all sorts of information. What information in the header is used to get the packet to the proper destination machine?

The IP address is used to determine what machine to deliver a packet to.

c) You do a traceroute from a machine at UBC to the Louvre Museum website which is hosted in Paris. You do the same from a machine at SFU and observe that there are lots of hops in common. You do the same thing at a coffee shop near Boundary and Grandview, which is halfway between SFU and UBC and observe that there aren't a lot of hops in common. Explain why this might be.

This is all about ASes. UBC and SFU, both being educational institutions are served by BCNet and Canarie. A coffee shop is almost surely using a commercial Internet provider. Because the packets from UBC and SFU see many common routers we know that they share an AS that is "close" to the source. Because UBC and the coffee shop don't see many common routers, we know that they do not share a common AS that is close to the source.



Name:

Student No:

8 2) CIDR, prefix matching and routing.

a) What is the range of addresses represented by this CIDR address 127.98.0.0/19. Write your answer in standard dotted-decimal notation.

127.98. 000x. xxxx . xxxx. xxxx The 19th bit is just to the left of the x's so the starting address is 127.98. 0000 0000. 0000 0000 → 127.98.0.0 Now turn the bits after the 19th to 1
127.98. 0001 1111. 1111 1111 → 127.98.31.255 So the range is 127.98.0.0 → 127.98.31.255

b) Consider the following routing table

Link	
1	135.16.3.0/24
2	135.16.2.0/24
3	135.16.4.0/22
4	148.64.0.0/10
5	148.78.0.0/21
6	otherwise

Compute ranges for each entry

135.16.3.0 → 135.16.3.255
135.16.2.0 → 135.16.2.255
135.16.4.0 → 135.16.7.255
148.64.0.0 → 148.127.255.255
148.78.0.0 → 148.78.7.255

Then use these in figuring out what goes where

Which link will each of the following incoming packet addresses be directed to? Show your work.

148.78.1.89

5 -

148.78.35.12

4 – since 37 > 7 in the /21

135.16.1.156

6

135.16.7.81

3

c) There are some pairs of addresses in this routing table(ignoring the 0.0.0.0/0 address for link 6) that can be aggregated. Show which ones can be aggregated and the resulting CIDR address. If more than one pair of addresses can be aggregated, then do them all.

Since 4 includes 5 just announce it 148.64.0.0/10

1 and 2 can be merged to 135.16.2.0/23 3 can't be merged with anything



Name:

Student No:

- 5) 3) List, in their proper order, the layers of the protocol stack and provide a one sentence description of the primary role of that layer.

Application Layer – this is the highest layer and is the layer that provides the service users typically interact with.

Transport – responsible for deliver between the sending/receiving programs and, typically, the ordering and correction of errors

Network – responsible for the information needed to route of packets from the source to destination machines (interfaces)

Link – responsible for the delivery of packets between adjacent nodes in the networking

Physical – Converts the bytes to the appropriate format for signaling, ex light pulses, radio waves.

- 4) Answer the questions which follow based on this traceroute:

8
traceroute to cs.berkeley.edu (128.32.189.62), 64 hops max, 52 byte packets
1 142.103.10.253 (142.103.10.253) 3.878 ms 1.519 ms 1.169 ms
2 a0-a1.net.ubc.ca (142.103.204.138) 1.554 ms 1.438 ms 1.303 ms
3 anguborder-a0.net.ubc.ca (137.82.123.137) 1.305 ms 1.256 ms 1.163 ms
4 343-oran-cr1-ubcab.vncv1.bc.net (134.87.2.234) 2.149 ms 4.315 ms 2.686 ms
5 205-oran-cx5.vncv5.bc.net (205.189.32.172) 1.378 ms 2.145 ms 1.363 ms
6 cenichpr-1-is-jmb-778.snvac.pacificwave.net (207.231.245.129) 22.220 ms 21.903 ms 21.773 ms
7 hpr-ucb--svl-hpr-10g.pacificwave.net (137.164.27.133) 23.566 ms 36.204 ms 23.600 ms
8 t1-3.inr-201-sut.berkeley.edu (128.32.0.65) 23.453 ms
t1-3.inr-202-receev.berkeley.edu (128.32.0.67) 24.435 ms
t1-3.inr-201-sut.berkeley.edu (128.32.0.65) 23.930 ms
9 t5-4.inr-210-srb.berkeley.edu (128.32.255.125) 23.565 ms
t5-5.inr-210-srb.berkeley.edu (128.32.255.37) 23.962 ms
t5-4.inr-210-srb.berkeley.edu (128.32.255.125) 23.467 ms
10 cs.berkeley.edu (128.32.189.62) 23.718 ms 24.115 ms 23.667 ms

- a) Estimate the number of ASes a packet traverses to its destination. Justify your answer. (You will be marked on the reasoning as opposed to the number you produce.)

Base the estimate on the names of the hops. Common names, especially ones that belong to a service provider are almost certainly in the same AS. Given this there would be the UBC AS, BCNet AS, PacificWave AS, and Berkeley AS for a total of 4.

- b) Which is the **best** example of congestion and why?



Name:

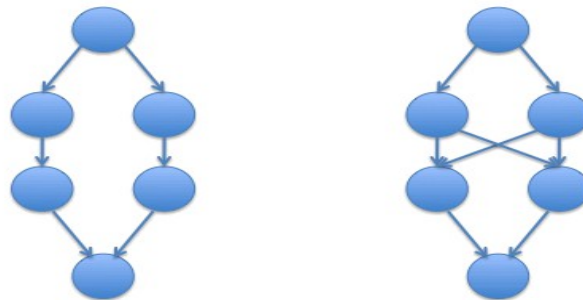
Student No:

7 Because of the large increase in times relative to 6, the high variability in the times to that router, and the fact that the times after 7 drop back down again.

c) What does it mean that there are multiple different routers identified at 8 and 9 hops away from the source? Explain clearly.

There is more than one next-hop between 7 and 8 (It is the 8th hop that has the different end point which is why we know that the multiple routes are from 7 to 8). The same is true between 8 and 9.

d) Which of the following pictures best describes what is going on 7, 8, 9, and 10 hops away from the source? Explain your answer clearly.



The second one. Each packet that traceroute sends into the network is independent. There is no meaning to the coincidence that the first and third packets, and the second and fourth packets report the same two routers.