

ITS 323 – ASSIGNMENT 2

Due Friday 21 August 2007, 5pm

10% of the final course mark

Name: _____

ID: _____

Mark (max: 62):

Instructions

1. This is an individual assignment. You must complete the assignment *on your own*. You should not work with others on this assignment – if you need help, then you should ask the lecturer!
2. The assignment can be neatly handwritten or typed on a computer.
3. You must give the final answers for questions on the space provided on the Assignment.
4. In Questions 3 and 4 you should include your calculations on the space provided (if there is not enough space, use the back of the sheet or attach additional sheets). Failing to show your calculations for a question may result in reduced or 0 marks, even if the answer is correct. (Calculations for Questions 1, 2 and 5 do not need to be shown, however if you do have calculations, include them on the back of the sheet).
5. Copying and other forms of plagiarism (e.g. copying answers from the Internet or textbooks) will be penalised.
6. You must submit a hardcopy of the assignment. Staple at the top left hand corner. Do not include plastic covers or bind the assignment in other ways. Email submission is not accepted.
7. Hints and/or clarifications of questions may be posted on the ITS323 mailing list.

Assumptions

Unless it is stated in the question, you can make the following assumptions:

1. Speed of transmission is the speed of light: 3×10^8 m/s
2. 1GB = 1000MB; 1MB = 1000KB; 1KB = 1000B; 1B = 8 bits
3. b = bit; B = Byte
4. Give the IP address in dotted decimal notation.

Special Case

If your ID contains zeros (e.g. 4812345670) then replace those zeros with 1 for the calculations. That is, your ID for calculations will be 4812345671. That is, there must be no 0's in the ID you use for calculation.

Question 1 [13 marks: 1, 2, 2, 2, 2, 2, 2]

Reverse your ID, and then using the first eight digits, take every two digits to form a dotted decimal IP address. For example, with ID 4812345678, you first reverse it (8765432148), take the first eight digits (87654321) and take the digits in pairs to create the IP address: 87.65.43.21.

IP Address: _____

Assuming your computer is using this calculated IP address, answer the following questions:

a) If classful addressing is used:

i. What is the class of the IP address?

Class: _____

ii. How many computers, other than yours, can be located on the same network as yours?

Number of computers: _____

iii. What IP address would your computer send to in order to reach all other computers on your network?

IP Address: _____

b) If classless addressing is used:

i. What is the network address with subnet mask /17?

IP Address: _____

ii. How many computers, other than yours, can be located on the same network as yours?

Number of computers: _____

iii. What IP address would your computer send to in order to reach all other computers on your network?

IP Address: _____

Question 2 [14 marks: 2, 2, 10]

In this question you will generate a network of 8 nodes. Your network can be defined in a 8x8 matrix, where the elements in the matrix identify the link cost from one node (row) to another (column). A value of 0 means there is no link from the node in the row to the node in the column (obviously, there is no link from node 1 to node 1, and so on). To generate your matrix, write your 10 digits (those generated in the previous step) in REVERSE ORDER into the *empty* boxes in the matrix below, row by row (that is, left to right in the first row, then continue left to right in the second row, and so on). Repeat the 10 digits as needed.

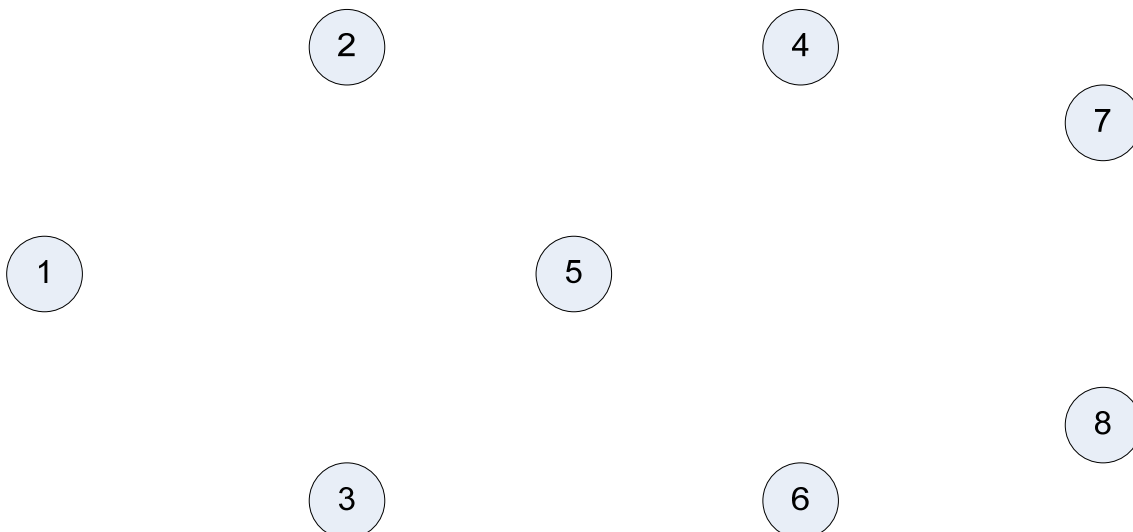
For example, if the ID is 4812345678, then we first reverse the digits (8765432148), then the first empty entry (column 2, row 1) would be 8, the second empty entry (column 3, row 1) would be 7, and the third empty entry (column 1, row 2) would be 6. The last empty entry (column 7, row 8) would be 1.

- a) Complete your network connectivity matrix.

Network Connectivity Matrix

		To node ...							
		1	2	3	4	5	6	7	8
From Node ...	1	0			0	0	0	0	0
	2		0	0			0		0
	3		0	0	0			0	0
	4	0		0	0				0
	5	0				0		0	0
	6	0	0				0	0	
	7	0		0		0	0	0	
	8	0	0	0	0	0			0

- b) Draw your network, indicating the direction of links and costs, on the figure below.



- c) Using Dijkstra's algorithm, determine the least cost paths from node 1. You must manually perform the steps, using the table approach followed in the lecture. Show your steps in the table below, using as many rows as necessary.

Step	T	L(2)	P(2)	L(3)	P(3)	L(4)	P(4)	L(5)	P(5)	L(6)	P(6)	L(7)	P(7)	L(8)	P(8)
1															
2															
3															
4															
5															
6															
7															
8															
9															
10															
11															
12															

Question 3 [18 marks: 6, 6, 6]

In your network from Question 2, if the least cost path is used to route packets from node 1 to node 8, calculate the total time it takes to transfer 1000 bytes if datagram packet switching is used with maximum packet sizes of:

- | | |
|--------------|--------------------|
| a) 500 bytes | Time [msec]: _____ |
| b) 250 bytes | Time [msec]: _____ |
| c) 100 bytes | Time [msec]: _____ |

You should make the following assumptions:

- Give your answer in milliseconds
- Each packet has a 40 byte header added to it
- All links have a transmission speed of 100,000 bytes/sec
- Propagation delay of each link is the link cost, given in milliseconds. For example, if the link cost from node 1 to node 2 is 5, then the propagation delay for that link is 5ms.
- Queuing delays and processing delays are 0.

Calculations (use the back of this sheet and/or attach additional sheets if needed)

[Space for calculations]

Question 4 [10 marks: 8, 2]

In Question 2, least-cost routing was used in your network. In this question, instead of least-cost routing, flooding is used. Make the following assumptions:

- Each packet has a unique identifier. A copy of a packet uses the same identifier as the original.
- If a node receives a packet that it has previously transmitted, then the node does not retransmit the copy. (That is, each node will only send a packet on each output link once).
- There is no hop count used.
- A node does not send a copy of the packet to a node that it has already received the packet from.
- The cost of transmitting a packet is equivalent to the link cost. For example, if a packet is transmitted on a link with cost 5, then the packet incurs a cost of 5.
- Transmissions occur in phases (or steps), similar to the example given in the lecture. Node 1 transmits in step 1. Then in step 2, the nodes that received from node 1 transmit at the same time.

A single packet is sent using flooding by node 1. The destination is node 8.

- a) What is the total cost of transmission in the network to send the single packet? (That is, the sum of the costs of all packets transmitted).

Cost: _____

- b) What is the total cost of transmission in the network to send the single packet if least-cost routing was used instead of flooding (ignore any cost of determining the route)?

Cost: _____

Calculations (use the back of this sheet and/or attach additional sheets if needed)

Question 5 [7 marks: 0, 2, 1, 2, 2]

On your PC you can use programs and commands to view and edit the details of your computers interfaces and connections. In this question you will use some simple commands on your own computer.

Perform the following tasks either on:

1. Your personal PC or laptop while connected to the Internet (that is, if you are using your laptop, make sure you have an active Internet connection when performing the tasks).
2. An SIIT lab computer.

Do not use your friends computer – that is, make sure you perform the tasks yourself on your own computer. The intention is that everyone performs the tasks on their own.

In Microsoft Windows XP, the following tasks can be performed by opening a Command prompt (e.g. go to “Start” menu, select “Run...” and enter the program “cmd”).

In Linux (such as Ubuntu) you can perform the tasks in a shell.

- a) What computer did you use for the tests? (circle only one)
 - a. Home/Dormitory desktop computer
 - b. Personal Laptop
 - c. SIIT Lab computer in Room _____ (enter the room number)
 - d. Other (describe) _____

- b) Look at the interfaces of your computer and record the details in the table below.

- Windows XP: `ipconfig /all`
- Ubuntu Linux: `ifconfig`

If you have multiple interfaces, record them all (e.g. draw another table for the second one).

Hardware Address	
IP Address	
Subnet Mask	
Broadcast Address	

- c) Using the IEEE address assignment database at <http://standards.ieee.org/regauth/oui/>, determine the manufacturer of your Ethernet card.

Manufacturer: _____

d) Look at the routing table for your computer and record *up to* 4 routes.

- Windows XP: `route print`
- Ubuntu Linux: `route`

Note that Gateway refers to the Next Router.

Route	Destination	Gateway	Interface	Metric
1				
2				
3				
4				

e) When you are browsing the web (or using another Internet application such as instant messaging), which router do you think your traffic is sent via. Why?

Answer (and explanation):