Student name______________________________ Student ID___________________

COMP 361 Computer Communications Networks

Fall Semester 2002

Midterm Examination 2

Date: November 14, Time 16:30pm : 17:50pm

Instructions:

1. This is a closed book exam
2. This examination paper consists of 5 pages and 7 questions
3. Please write your name, student ID and Email on this page.
4. For each subsequent page, please write your student ID at the top of the page in the space provided.
5. Please answer all the questions within the space provided on the examination paper. You may use the back of the pages for your rough work.
6. Please read each question very carefully and answer the question clearly and to the point. Make sure that your answers are neatly written, readable and legible.
7. Show all the steps you use in deriving your answer, where ever appropriate.
8. For each of the questions assume that the concepts are known to the graders. Concentrate on answering to the point what is asked. Do not define or describe the concepts.

Question	**Points**	**Score**
1	10	
2	15	
3	10	
4	10	
5	20	
6	15	
7	20	
TOTAL	100	

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1. Answer the following true/false questions by circling either T or F (10 points)

(a) Host A is sending host B a large file over a TCP connection. Assume host B has no data to send to A. Host B will not send acknowledgements to host A because host B cannot piggyback the acknowledgements on data. T **F**

(b) The size of TCP RcvWindow never changes throughout the duration of the connection. T **F**

(c) Suppose host A is sending host B a large file over a TCP connection. The number of unacknowledged bytes that A sends cannot exceed the size of the receive buffer. **T** F

(d) Suppose host A is sending a large file to host B over a TCP connection. If the sequence number for a segment of this connection is m, then the sequence number for the subsequent segment will necessarily be m+1. T **F**

(e) The TCP segment has a field in its header for RcvWindow. **T** F

(f) Suppose that the last SampleRTT in a TCP connection is equal to 1sec. Then Timeout for the connection will necessarily be set to a value >= 1 sec. T **F**

(g) Suppose host A sends host B one segment with sequence number 38 and 4 bytes of data. Then in this same segment the acknowledgement number is necessarily 42. T **F**

(h) Consider congestion control in TCP. When a timer expires at the sender, the threshold is set to one half of its previous value. T **F**

(i) Every autonomous system uses the same intra-autonomous system routing algorithm. T **F**

(j) Hierarchical organization of the Internet has helped to scale to millions of users. **T** F

2. Consider a general topology and a synchronous version of distance vector algorithm (in one iterative step all the nodes compute their distance tables at the same time and then exchange them). Suppose that at each iteration, a node exchanges its minimum costs with its neighbors and receives their minimum costs. Assuming that the algorithm begins with each node knowing only the costs to its immediate neighbors, what is the maximum number of iterations required until the distributed algorithm converges? Assume that the length of the longest minimum path between two nodes is d. Justify your answer. (15 points)

Answer: Let d be the diameter of the network, i.e. the length of the longest path without loops between any two nodes in the network. After d-1 iterations, all nodes will know the shortest path cost of d or fewer hops to all other nodes. Since any path with greater than d hops will have loops (an thus have a greater cost than the path with loops removed) the algorithm will converge in at most d-1 iterations

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3. Perform CIDR aggregation on the following/24 IP addresses: 128.56.24.0/24, 128.56.25.0/24, 128.56.26.0/24, 128.56.27.0/24? (10 points).

Answer: 128.56.24.0/22.

4. In a network that has a maximum packet size of 128 bytes, a maximum packet lifetime of 30s, and a 8 bit packet sequence number, what is the maximum data rate per connection ? (10 points)

   Answer: 8-bit sequence number allows 255 outstanding packets with sliding window flow control. These 255 packets must be delivered in 30s. Therefore maximum data rate is
   R= (128*255*8)/30

5. a) Suppose that the advertized receiver window is 1 Mbyte long. If a sequence number is selected at random from the entire sequence number space, what is the probability that the sequence number falls inside the advertised window? (10 points)

Answer: P= 2^(20)/2^32

b) Consider the three way handshake in TCP connection setup. Suppose that an old SYN segment from station A arrives at station B, requesting a TCP connection. Explain how the three-way handshake procedure ensures that the connection is rejected. (10 points)

Answer: Host B will reply with SYN, acknowleding the received SYN. When A receives the SYN segment with acknowledgement it will conclude that it did not initiate the connection and send back the RST segment, i.e it will not reply with the data segment acknowledging the recived SYN segment from B.

5. Suppose an ISP has 1000 customers and that during the busiest hour of the day the probability that a particular user requires service is 0.2. The ISP uses DHCP. Is a Class C address enough to make the probability less than 1% that no IP address is available when a customer places a request?

Note:It is sufficient if you set up the expression from which the probability of exceeding IP address space can be calculated. (15 points)

Answer: yes

```
> sum(binomial(1000,k)*(0.2^k)*0.8^(1000-k), k=254..1000);
```

.00001966712664

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7. The nodes participating in the reliable flooding algorithm in one network are broadcasting the following link state packets. Link state packets have sequence numbers and time to live fields in order to implement reliable flooding protocol. Based on those packets draw the network topology, assign link costs and find shortest paths for node D using the link state routing algorithm . (20 points).

B	
Seq. no	
time to live	
A	4
C	3
F	6

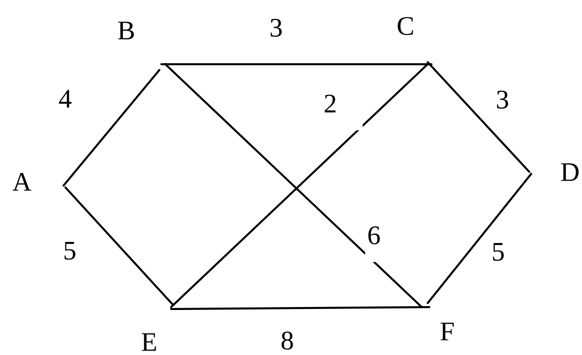
C	
Seq. no	
time to live	
B	3
D	3
E	2

D	
Seq. no	
time to live	
C	3
F	5

E	
Seq. no	
time to live	
A	5
C	2
F	8

F	
Seq. no	
time to live	
B	6
D	5
E	8

Answer:



step	N	D(A),p(A)	D(B),p(B)	D(C), p©	D(E),p(E)	D(F),p(F)
0	D	infty	infty	3,D	infty	5,D
1	DC	infty	6,C		5,C	5,D
2	DCE	10,E	6,C			5,D
3	DCEF	10,E	6,C			
4	DCEFB	10,E				
5	DCEFBA					