



**CMPS 284 Final Exam
American University of Beirut
Department of Computer Science**

Date: January 27th 2004

**This is a CLOSED BOOK: notes, textbooks, AND calculators are NOT permitted.
You have two hours to finish
Answer in the spaces provided. Use additional sheet when needed.**

The questions are not all of equal difficulty, do the easy ones first.

Good Luck

Name :
Student # :
Section :

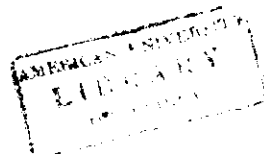
- Problem 1 /18 marks**
- Problem 2 /12 marks**
- Problem 3 /22 marks**
- Problem 4 /23 marks**
- Problem 5 /25 marks**



**Problem #1 (18 points)**

Please circle T if you think the answer is mostly true, and F if you think the answer is mostly false. In case of F, justify why or provide a correct statement.

- T F Replay means packets are delivered out of order.
- T F An Internet path with more hops always involves a greater delay than a path with fewer hops.
- T F MTU stands for Minimum Transport Unit
- T F The fundamental building blocks of a WAN include packet switches and high-speed connections between them.
- T F RARP is used to translate hardware addresses into IP addresses.
- T F First router that receives packet fragments reassembles the fragments to reconstruct the packet.
- T F OSI layering model contains eight layers named respectively 1. Physical, 2. MAC, 3. Logical Link, 4. Network, 5. Transmission, 6. Session, 7. Presentation, 8. Application,.
- T F If D_0 is the delay when the network is idle, and U is a value between 0 and 1 that denotes the current utilization, then $D_0/(1-U)$ gives a value for the *actual or effective throughput*.



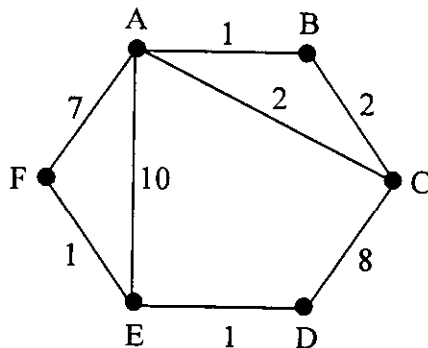


Problem # 2 (12 points)

1. Routing is accomplished in most WANs by dynamically updating routing tables. What are the two algorithms used for distributed route computation? (1 points)

2. Which one of them uses Dijkstra's algorithm? (1 point)

3. Use Dijkstra's algorithm to find the shortest path from node A to node D for the following graph. Be sure to show your steps. (10 points)





Problem # 3 [22 points]

1. What are the three main causes, or components, of delay in a packet switched network? (3 points)

2. Identify two key differences between connectionless and connection-oriented transport protocols. (4 points)

Connection Oriented	Connectionless

3. In general what does "reliability" protect against? (3 points)



6. Below is the flow chart for TCP/IP client-server. (4 points)

SERVER

socket()
bind()
listen
accept()
send()/recv()
close()

CLIENT

socket()
connect()
send()/recv()
close()

From what you know about UDP/IP, identify the necessary changes to the flowchart for UDP/IP client/server.

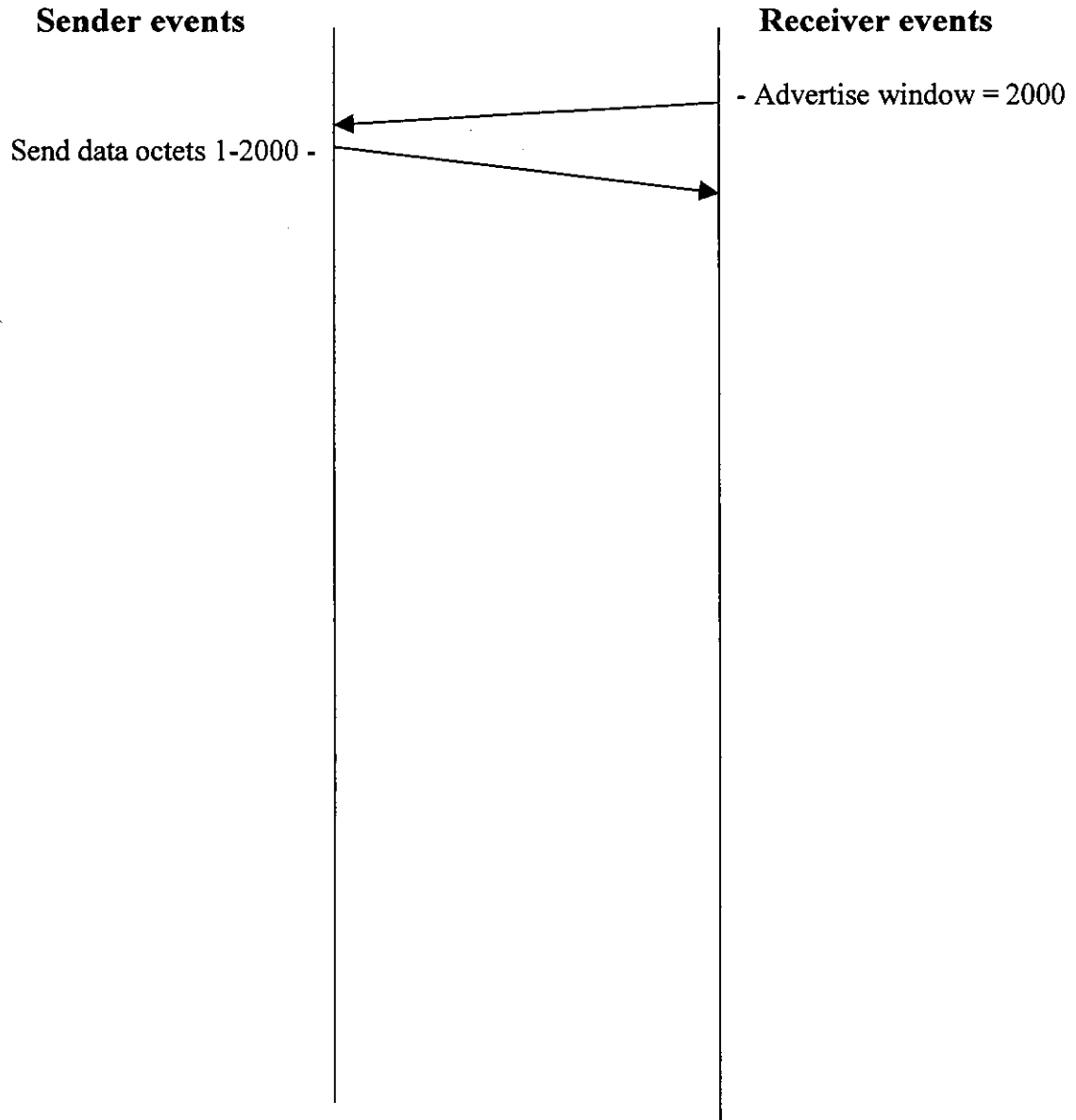


3. Give a brief definition of *positive acknowledgement with retransmission*. How does TCP use positive acknowledgement with retransmission? (4 points)

4. How does TCP help to reduce network congestion? (3 points)



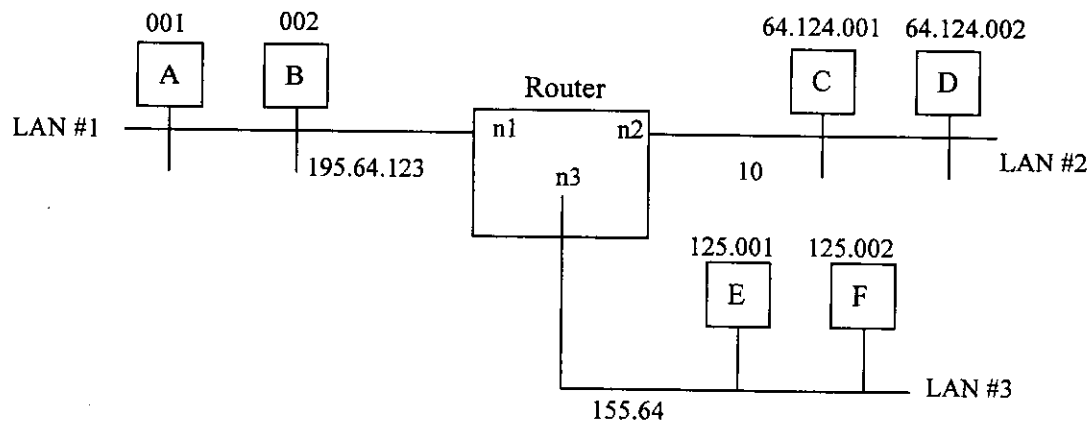
5. Flow Control in TCP is handled by the use of a window mechanism involving a window advertisement. Indicate below the sequence of data sends, acknowledgements, and window advertisements for the sender to send 5000 octets of data to the receiver with a maximum available buffer size of 3000 octets. Assume the sender can transmit at most 2000 octets of data at a time. Complete the sequence diagram below assuming no packet loss. (8 points)





Problem # 5 (25 points)

Consider the following network consisting of three two-station Ethernets attached via an IP router. Hosts A through F have hardware addresses of aaa, bbb, ccc, ddd, eee, and fff, respectively. Router has three interfaces n1, n2, and n3. Suppose that n1, n2, and n3 have hardware addresses xxx, yyy, and zzz, respectively. The host id is shown above each host, and the netid is shown below the Ethernet segment.



1. Describe the purpose of ARP and how it works (3 points).

2. Give the ARP table for station D assuming that D has recently communicated with all other stations. (4 points)

IP Address	Hardware Address



3. Routing Table

i. **What is an important advantage of using a bit mask for computing addresses? (2 points)**

ii. **Give the routing table for the router. (4 points)**

Network Id	Mask address	Next Hop

4. **If A sends F an IP packet, explain what takes place by sketching the packet headers (key fields only - namely the address fields) for a packet as it flows from host A to host F (4 points).**





5. What does CIDR stand for? (2points)

6. If an ISP assigns a customer a CIDR prefix of 128.65.0.48 / 28, give the corresponding: (6 marks)

	In binary				In dotted decimal
Network Prefix					
Address Mask					
Lowest Host Address					
Highest Host Address					

