

**Graduate Comprehensive Exam: Computer Networks (Spring 2001)**

Answer *all* questions on the exam. You may use the back for additional space. Total: 100 points. Good Luck.

1. (30 pts):

- (a) What is a network reference model and why are they necessary?
- (b) Contrast the differences between TCP and OSI
- (c) If a printer can interpret physical addresses but cannot interpret an IP address, at what layer it is failing?  
Explain your answer

2. (30 pts) In routing:

- (a) Discuss fairness and optimality and describe the conflict that occurs between these two routing goals.
- (b) What is the difference between adaptive and non-adaptive routing algorithms?
- (c) Describe one adaptive **and** one non-adaptive routing algorithm.

3. (20 pts) Given that  
Latency = Propagation Delay + Transmit Time + Queue  
Transmit Time = Size / Bandwidth

Calculate:

- (a) the approximate total time (in seconds) required to transfer 1.5MB(Megabyte) file given that the RTT (Round-Trip Time) is 200ms, the bandwidth is 2Mbps(Megabit/sec), packet size is 1KB (Kilobyte) but all data packets can be sent continuously.
- (b) the same as above but there is an initial handshaking before the data is sent which costs  $2*RTT$

4. (20 pts):

(a) What is a digital signature?

(b) Describe two ways digital signatures could be implemented