

Name: _____ ID:

ECE 146 Final

Fall 2002

| Problem | Max | Grade |
|---------|-----|-------|
| 1 | 25 | |
| 2 | 25 | |
| 3 | 25 | |
| | 25 | |

Total 100

Open Book, Open Notes, Calculator O.K.

Problem 1

Answer each of the following in one or two complete English sentences. 5 points each. I will take off up to one point each for poor grammar or spelling.

a. IP-based networks typically cannot provide Quality of Service. Why?

b. Since ATM offers QOS and IP does not, can IP-over ATM networks support QOS? Why or why not?

c. TCP offers a variable window size. What is the primary issue if the window size is set too small?

d. TCP does not receive NAKs in the event of errors but times out and automatically retransmits. How would TCP set the correct value of this timer?

e. The TCP/IP client and server exchange initial sequence numbers as part of connection setup. This sequence number usually is a random number rather than a fixed number (such as 0). Why?

Problem 2

Today's compact disk digital audio supports the following characteristics:

Audio Bandwidth 10Hz to 20,000Hz

Sampling Rate 44.1kHz

Each sample coded into 16 bit PCM

Each coded audio sample mapped into 49 bits (for error correction and synchronization)

Two such channels are time division multiplexed (no additional framing overhead for multiplexing) for stereo

- a. What is the required bit rate for CD stereo sound? 15 points
- b. How much music in this format could be stored on a CD-ROM with capacity 600MByte? 10 points.

Problem 3

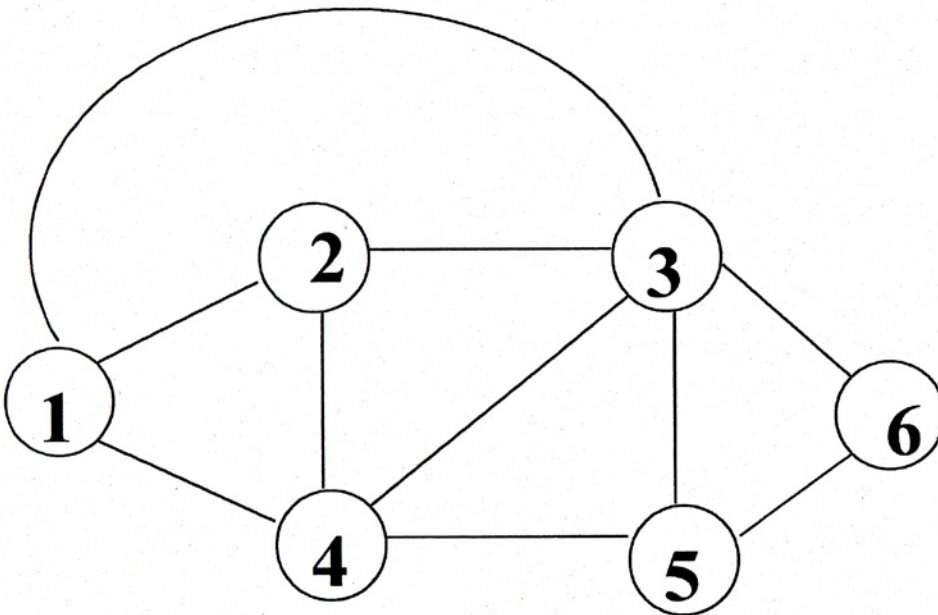
Attached is an ATM network for which you have decided to use Dijkstra's routing algorithm. Also attached is a cost matrix which, you will note, is asymmetric. You are to develop the least cost path (from source node3) and the cost of that path for each destination. Please put your results in the form of Figure 33.5 (class notes).

Cost Matrix

To Node j

From
Node i

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|----------|----------|---|----------|----------|----------|
| 1 | 0 | 2 | 5 | 1 | ∞ | ∞ |
| 2 | 3 | 0 | 3 | 2 | ∞ | ∞ |
| 3 | 4 | 4 | 0 | 3 | 1 | 5 |
| 4 | 2 | 3 | 2 | 0 | 1 | ∞ |
| 5 | ∞ | ∞ | 4 | 3 | 0 | 2 |
| 6 | ∞ | ∞ | 7 | ∞ | 1 | 0 |



Problem 4

ATM is a packet switched system based on a small 53 Byte “cell”. Due to the small length of the packet and the presumed quality of the facilities, there is no link by link error control, only end to end (if the user so-desires). For the following ATM connection and a probability of error P_e on each of the links of 10^{-8} , how many of the ATM cells arrive in error at the destination in a 10 minute period? State clearly any required assumptions.

