 Name _____

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Sloan School of Management

**15.565 – INTEGRATING INFORMATION SYSTEMS:
TECHNOLOGY, STRATEGY, AND ORGANIZATIONAL FACTORS**

**15.578 – GLOBAL INFORMATION SYSTEMS:
COMMUNICATIONS & CONNECTIVITY AMONG INFORMATION SYSTEMS**

Spring 2002

SAMPLE FINAL EXAMINATION

GENERAL PROCEDURES

1. This examination is open book.

2. Read each problem completely before starting to answer it. Note the point values assigned to each problem and budget your time accordingly.

3. Your answers should be brief but complete. It is more advantageous to answer all the questions, briefly outlining the major points, than to answer only one or two in great detail.

4. Think. Organize. Do not spend too much time on any one question.

5. Write all answers in this exam booklet. If scratch work is not to be graded, clearly rule it out. If you do not have room to answer a question in the space provided, clearly write "continued on opposite page" and use the back of the preceding page, clearly indicating question and part number.

6. Write your name on every page. Check page numbers to ensure that your exam is complete.

7. You will have 90 minutes to complete the examination.

   [NOTE: For Spring 2002, you will have about 3 hours - twice as much time.]

Question #			
1.	25 points	_____	Logical Connectivity
2.	25 points	_____	Strategic/Organizational Connectivity
3.	25 points	_____	Organizational Connectivity
4.	25 points	_____	Physical Connectivity
	100 points	_____	TOTAL

Question 1 -- Logical Connectivity (25 points)

Consider the following two databases, each containing 2 tables/relations on separate computers:

Computer A: Portfolio database	Computer B: Financial Info database
CLIENT (ID, NAME, ADDRESS)	COMPANY(NAME, INDUSTRY, ADDRESS)
HOLDING (ID, COMPANY, SHARES, PRICE)	FINANCIALS(NAME, YEAR, SALES, PROFIT)

a) Explain, in simple English, what the following SQL query does:

```
select CLIENT.NAME, HOLDING.COMPANY, HOLDING.SHARES
from CLIENT, HOLDING, FINANCIALS
where FINANCIALS.PROFIT < 0 and FINANCIALS.YEAR=1998
and  FINANCIALS.NAME = HOLDING.COMPANY
and CLIENT.ID = HOLDING.ID
```

b) Draw the Entity-Relationship (ER) schema diagrams corresponding to the two databases.

c) Now integrate the two schemas into a single global schema. Explain all the key steps involved.

d) Suggest at least two context semantics (meaning differences) problems that you might encounter.

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Question 2 -- Strategic/Organizational Connectivity (25 points)

(The following question refers to the following article – Wysocki, Bernard. Jr. "The Outlook: Corporate Caveat: Dell or be Delled." *Wall Street Journal*. May 10, 1999, pp. 1.)

On the front page of the *Wall Street Journal* was an article entitled: "Corporate Caveat: Dell or be Delled" that discussed the use of the word "Dell" as a verb in reference to Dell Computer Company. In the middle of the article was the following:

> *" … the idea of putting digital networks at the heart of their company is the vision that has excited senior executives across the U.S. Last year, they spent about $40 billion just on 'enterprise technology,' designed to streamline the flow of information around companies."*

a) Using Strategic Connectivity concepts from 15.578, identify at least three benefits can one gain from the ability to "streamline the flow of information around the company"?

Later in the article, it goes on to say:

> *"Senior executives regularly discover that they have spent tens of millions of dollars fixing their year-2000 computer problems with the new systems, but have often failed to transform their companies into digital powerhouses."*

b) Using Organizational Connectivity concepts from 15.578, how might you explain this disappointment? Give at least two reasons. To help make your points more focused, use an actual (or hypothetical but plausible) example.

c) What could be done to overcome the problems of (b) above?

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Question 3 -- Organizational Connectivity (25 points)

One of the cases discussed in 15.578 was the Next Generation Global Foreign Exchange System (FXX). Briefly, FXX was intended to replace all the existing disparate foreign exchange systems around the world (one in each major country and that traded that country's currency) with a standardized trading system (one copy at each location). Each of these systems would forward a copy of each trade to a single global database which could be used to monitor and control overall risk by headquarter executives.

a) Using the Standards evaluation formalism proposed by Sirbu, who were the traditional "buyers" and "sellers" of the trading systems?

b) Using the Sirbu model: (i) Would you predict that a standard software system would emerge? And (ii) How does the new requirements for headquarters risk control change things?

c) Although there were many technical problems, the FXX project demise was also motivated by the empathy and resistance of key executives in the distributed trading rooms? Using the concepts from 15.578, give at least two reasons to explain this situation?

d) Using Madnick's Motivating Strategic Alliances model, what would you have suggested to overcome the problems of part (c) above?

Question 4 -- Physical Connectivity (25 points)

Fiber optic technology is providing the capability for Gigabit (billion bit per second) communications. This is introducing new considerations.

a) When packet switching was first introduced, we assumed that communication lines were limited speed and expensive whereas the switches (actually software programmed computers) were fast and relatively cheap. Now that gigabit communication lines are very fast and relatively cheap compared with switches, the switches can be a bottleneck. Identify at least four ways that the "switch bottleneck" can be decreased.

Another new problem relates to the impact of latency (transmission delay, which is determined by the speed of light) versus bandwidth (i.e., bits per second).

Two useful numbers are: (i) at 1 gigabit (Gb), a 1 megabit (Mb) packet takes approximately 1 millisecond (1000 microseconds) to transmit and (ii) it takes approximately 5 microseconds for light/electricity to travel 1 mile. Thus, to transmit a 1 Mb packet from one node to another node 1 mile away, it will take 1005 microseconds (approximately 1 millisecond).

Assume that the file transfer protocol used is: (i) send request to transmit (RTT), (ii) await OK to transmit (OTT) response, (iii) send data packet, (iv) await acknowledgement (ACK), and then start over for next packet.

b) How long will it take to send a 10 Mb file to another node 1 mile away in 1 Mb packets? For simplicity, assume that the RTT, OTT, and ACK messages are approximately 1 Kb (1,000 bits) and that there are no additional overhead or delays caused by either the switching nodes or the sending or receiving computer (i.e., assume that all the computers are infinitely fast).

c) Using the same assumptions, how long will it take to send the 10 Mb file to another node 3000 miles away?

d) On typical packet networks, packet sizes are typically 1 Kb. If 1 Kb packets were used, would that change your answer to part (c)? By about how much?

e) What suggestions could you make to improve the performance of such gigabit networks for long distance file transfers?

HAVE A GREAT SUMMER!!!