Chapter 1: The Importance of MIS

Notes from Multiple Choice Questions

"The number of transistors per square inch on an integrated chip doubles every 18 months." This observation is known as **Moore's Law**.

As a result of Moore's Law, the price to performance ratio of computers has fallen dramatically.

Because of Moore's Law, the cost of data communications and data storage is essentially zero.

The cost of **data storage** is so low that it is essentially free.

Because the cost of data storage and data communications is essentially zero, any routine skill will be **outsourced to the lowest bidder**.

In today's world, skills such as tax accounting and computer programming no longer guarantee job security. What is the reason for this?
They are routine skills, which can and will be outsourced to the lowest bidder.

Peter is an engineer working in the United States. In accordance with Moore's Law, which of the following is a nonroutine cognitive skill that would provide him with job security? **Systems thinking**.

Modeling system components and showing how components' inputs and outputs relate to one another is attributable to **systems thinking**.

Creating and testing promising new alternatives, consistent with available resources is an example of **experimentation**.

Abstract reasoning is the ability to make and manipulate models.

Systems thinking is the ability to model the components of a unit, to connect the inputs and outputs among those components into a sensible whole that reflects the structure and dynamics of the phenomenon observed.

Collaboration is the activity of two or more people working together to achieve a common goal, result, or work product.

In a job interview, you are asked to make a group presentation with four other interviewees. You are required to form a team and then compete with other groups to win the presentation contest. Which of the following skills is your interviewer trying to test? **Collaboration**

Patricia is the marketing manager at a manufacturing firm. She develops ideas and plans with her subordinates and provides and receives critical feedback. Here, Patricia is displaying **collaboration** skills.

Which of the following is necessary for effective collaboration?
The ability to give and receive critical feedback

Which of the following marketable skills is the most useful in overcoming the fear of failure?
Ability to experiment

Experimentation involves making a reasoned analysis of an opportunity, envisioning potential solutions, evaluating those possibilities, and developing the most promising ones, consistent with the resources one has.

In a job interview, you are asked to use a product that you have never used before and are not familiar with. Which of the following skills is your interviewer trying to test?
Ability to experiment

A group of components that interact to achieve a purpose is referred to as a **system**.

When you use a computer to write a class report, you are using the computer, storage disk, keyboard, and monitor as tools. You use MS Word or some other word processing program, and type words, sentences, and paragraphs in your report. You also enter your report into the program, print it, and save and back up your file. In this situation, identify the procedure component of an information system.
Entering the report, printing it, and saving it

Which of the following is an example of the hardware component of an information system?
Microprocessor

The five-component framework of an information system consists of computer hardware, software, data, people, and **procedures**.

In a grocery store, the clerk scans the UPC code on an item, which is transmitted to the computer. The actual scanner device is an example of the **hardware** component of an IS.

What are key elements of the definition of management information systems (MIS)?
Information systems, development and use, and business goals and objectives

Which of the following is a valid reason for a company to create a new information system?
The new information system will increase employee productivity.

Information technology: the products, methods, inventions, and standards that are used to produce information.

Which of the following distinguishes information systems from information technology? **People**

Users should take security seriously is the most crucial requirement for the success of a security system?

An essential characteristic of a strong password: It should not contain your user name or company name.
You have created a password, which meets all the criteria for a strong password. What is a potential drawback of such a password? **It will be difficult to remember.**

Which of the following, if true, would weaken a password?
It contains a complete dictionary word in Latin.

Which of the following techniques is best suited for creating memorable, strong passwords?
Base passwords on the first letter of the words in a phrase.

In order to protect your password, you should never write down your password.

Which of the following statements on password etiquette is true?
If someone asks for your password, do not just give it out.

If someone asks for your password, go over to that person's machine and enter your password yourself.

Essay Questions

1) Define Moore's Law and explain how the phenomenon it describes affects the technology business.
Moore's Law states that the number of transistors per square inch on an integrated chip doubles every eighteen months. The more common version of this is expressed as "The speed of a computer chip doubles every eighteen months" which is incorrect. Due to the impact of Moore's Law, the price/performance ratio of computers has fallen dramatically over the past decade, and computers have shrunk dramatically in both size and cost while computing power has increased drastically. Moore's Law is the principal reason why data storage and data transmission are essentially free today. New businesses like YouTube and Facebook have taken advantage of the opportunities offered by this development.

2) What is a marketable skill?
It used to be that one could name particular skills, such as computer programming, tax accounting, or marketing as examples of marketable skills. But today, because of Moore's Law, because the cost of data storage and data communications is essentially zero, any routine skill can and will be outsourced to the lowest bidder. One has to develop strong non-routine cognitive skills to be more successful and such skills are called marketable skills. Abstract reasoning, systems thinking, collaboration, and ability to experiment are marketable skills.

3) What is abstract reasoning? Provide an example.
Abstract reasoning is the ability to make and manipulate models. Constructing a model of the five components of an information system is an example of abstract reasoning.

4) What is meant by systems thinking?
Systems thinking is the ability to model the components of a system, to connect the inputs and outputs among those components into a sensible whole that reflects the structure and dynamics of the phenomenon observed.

5) What is collaboration? How can one ensure effective collaboration?
Collaboration is the activity of two or more people working together to achieve a common goal, result, or work product. Effective collaboration isn't about being nice. In fact, surveys indicate the single most important skill for effective collaboration is to give and receive critical feedback.

6) What is experimentation? Explain its importance.
Successful experimentation is not throwing buckets of money at every idea that enters your head. Instead, experimentation is making a reasoned analysis of an opportunity, envisioning potential solutions, evaluating those possibilities, and developing the most promising ones, consistent with the resources you have. Fear of failure paralyzes many good people and many good ideas. This can be overcome by having the ability to experiment.

7) Describe an information system.
A system is a group of components that interact to achieve some purpose. An information system (IS) is a group of components that interact to produce information. An IS is based on the five-component framework of computer hardware, software, data, procedures, and people. These five components are present in every information system—from the most simple to the most complex.

8) Describe the five components of an information system using an example.
The five components of an information system are computer hardware, software, data, procedures, and people. When you use a computer to write a class report, you are using hardware (the computer, storage disk, keyboard, and monitor), software (Word, WordPerfect, or some other word-processing program), data (the words, sentences, and paragraphs in your report), procedures (the methods you use to start the program, enter your report, print it, and save and back up your file), and people (you).

9) Do you think a computer is an essential component of an information system? Why or why not?
Many information systems include computers. However, there are information systems that do not include computers. A calendar hanging on the wall outside of a conference room that is used to schedule the room's use is also an information system.

10) Define management information systems. What are the key elements of its definition?
Management information systems refer to the development and use of information systems that help businesses achieve their goals and objectives. This definition has three key elements: development and use, information systems, and business goals and objectives.

11) Other than development tasks, what are the other roles than you will need to undertake in the use of information systems?
In addition to development tasks, you will also have important roles to play in the use of information systems. You will need to learn how to employ the system to accomplish your goals. You will also have important ancillary functions as well. For example, when using an information system, you will have responsibilities for protecting the security of the system and its data. You may also have tasks for backing up data. When the system fails, you will have tasks to perform while the system is down as well as tasks to accomplish to help recover the system correctly and quickly.

12) What are the points one needs to keep in mind when deciding to implement a management information system (MIS)?
When deciding to implement an MIS, one needs to keep in mind that information systems are not created for the sheer joy of exploring technology. They are not created so that the company can be "modern" or so that the company can claim to be a "new-economy company." They are not created because the IS department thinks it needs to be created or because the company is "falling behind the technology curve." An MIS exists to help businesses achieve their goals and objectives. As a future business professional, you need to learn to look at information systems and technologies only through the lens of business need.

13) Explain the difference and the relationship between information technology (IT) and information systems (IS).
Information technology and information system are two closely related terms, but they are different. IT refers to methods, inventions, standards, and products. IT refers to raw technology, and it concerns only the hardware,

software, and data components of an information system. In contrast, an information system is a system of hardware, software, data, procedures, and people that produce information. IT, by itself, will not help an organization achieve its goals and objectives. It is only when IT is embedded into an IS—only when the technology within the hardware, software, and data is combined with the people and procedure components—that IT becomes useful.

14) What is the role of users in information security?
Like all information systems, security systems have the five components, including people. Thus, every security system ultimately depends on the behavior of its users. If the users do not take security seriously, if they do not follow security procedures, then the hardware, software, and data components of the security system are wasted expense.

15) Explain how you would create a strong password.
Strong passwords should have seven or more characters in them, consisting of upper and lower case letters, numbers, and special characters. They should not contain any complete dictionary word in any language, nor should they contain your user name, real name, or company name. They should also be different from any other password that you have previously used. An example of a strong password is Qw37^T1bb?at.

16) Explain the necessary password etiquette to be followed by users of an information system.
Once you have created a strong password, you need to protect it with proper behavior. Proper password etiquette is one of the marks of a business professional. Never write down your password, and do not share it with others. Never ask others for their passwords, and never give your password to someone else.

Chapter 2: Business Processes, Information, and Information Systems

Notes from Multiple Choice Questions

A **business process** is a network of activities, roles, resources, repositories, and data flows that interact to accomplish a business function.

Activities are collections of related tasks that receive inputs and process those inputs to produce outputs.

In a business process flowchart, activities are shown in **rectangles**.

Roles are sets of procedures.

Decisions are shown in **diamonds** in a business process flowchart.

A **decision** is a question that can be answered yes or no

Decisions provide branching points within the flow of a business process.

Roles are shown in **ovals** in a business process flowchart.

Resources are people, facilities, or computer programs that are assigned to roles.

Roles are shown above or below activities in a business process flowchart?

A **repository** is a collection of business records.

Repositories hold the collective memory of an organization?

Repositories are shown as scrolls in a business process flowchart.

What is the defining characteristic of the outermost components (hardware and people) of the IS framework?
They take actions

The software and procedure components of the IS framework are both **sets of instructions**.

The **software** component of the IS framework provides instructions for hardware.

The **procedure** component of the IS framework provides instructions for people.

In the IS framework, **data** is the bridge between the computer side on the left and the human side on the right.

Which of the following are *actors* in an information system?
Hardware and people
When work that was formerly done by people has been moved to computers, it is said to be **automated**.

Automation of a process activity consists of moving work from the **human side** to the **computer side** of the symmetrical five-component framework.

Information is defined as **knowledge derived from data**.

John Reed examines the stature of each of his team members on the school basketball team. He finds that the average height of the players is 6 feet 3 inches. John's finding is an example of **information**.

Data is defined as recorded facts or figures.

The fact that Jeff Parks works 9 hours per day is an example of **data**.

Which of the following is a characteristic of good information?
It must be contextually relevant

As the CEO of a call center, which of the following information is good information for you?
Department-level averages of revenue generation figures

Relevant information is information that directly pertains to both the context and to the subject it references.

Which of the following refers to information that is based on correct and complete data, and has been processed correctly as expected?
Accurate information

A monthly report that arrives 6 weeks late is an example of information that is not **timely**.

Which of the following is true regarding characteristics of good information?
Information must hold an appropriate relationship between its cost and its value.

A **problem** is the perceived difference between what is and what ought to be.

Egocentric thinking centers on the self.

People who engage in **empathetic** thinking consider their view as one possible interpretation of the situation and actively work to learn what other people are thinking.

Essay Questions

1) What is a business process? Define activities.
A business process is a network of activities, resources, facilities, and information that interact to achieve some business function. Activities are collections of related tasks that receive inputs and process those inputs to produce outputs. Activities can be manual (people following procedures), automated (hardware directed by software), or a combination of manual and automated.

2) List the components of a business process.
The components of a business process include:
1. Activities
2. Decisions
3. Roles
4. Resources
5. Repository
6. Data flow

3) Briefly describe a repository.
A repository is a collection of business records. A repository can be a cardboard box, a notebook, a list, an Excel spreadsheet, a database, or even a collection of databases. Repositories hold the collective memory of the organization. One of the major considerations in the design of information systems is determining how many repositories should exist, or, equivalently, how much data should be stored in particular repositories.

4) What are resources in a business process?
Resources are people, facilities, or computer programs that are assigned to roles. One way to improve the performance of a business process is to add resources to roles. One way to reduce costs is to reduce the number of people fulfilling a role. Another way to reduce costs is to replace human resources with computer-based resources.

5) Describe the process of automation against the background of the five-component framework of an information system.
The five components of an information system are hardware, software, data, procedures, and people. They are arranged symmetrically in the framework. The outermost components, hardware and people, are both actors; they can take actions. The software and procedure components are both sets of instructions: Software is

instructions for hardware, and procedures are instructions for people. Finally, data is the bridge between the computer side on the left and the human side on the right. When an activity in a business process is handled by an automated system, it means that work formerly done by people following procedures has been moved so that computers now do that work by following instructions in software. Thus, the automation of a process activity consists of moving work from the right-hand side of the five-component IS framework to the left.

6) Define information.
The most common definition of information is that information is knowledge derived from data, where data is defined as recorded facts or figures.

7) Explain data with an example.
Data is defined as recorded facts or figures. The fact that an employee of an organization earns $17.50 per hour and that another employee of the same organization earns $25.00 per hour is an example of data.

8) Define accurate information. Why is an information system providing accurate information crucial to an organization?
Good information is accurate information, which is information that is based on correct and complete data, and it has been processed correctly as expected. Accuracy is crucial; managers must be able to rely on the results of their information systems. The IS function can develop a bad reputation in the organization if a system is known to produce inaccurate information. In such a case, the information system becomes a waste of time and money as users develop work-arounds to avoid the inaccurate data.

9) Explain the importance of timeliness of information in an organization.
Timely information is information that is produced in time for its intended use. A monthly report that arrives 6 weeks late is most likely useless. The information arrives long after the decisions have been made that needed that information. An information system that tells you not to extend credit to a customer after you have shipped the goods is unhelpful and frustrating. Notice that timeliness can be measured against a calendar (6 weeks late) or against events (before we ship).

10) In some cases, developing systems that provide information in near real time is much more difficult and expensive than producing information a few hours later. Provide an example that supports this statement.
A person who works in marketing needs to be able to assess the effectiveness of new online ad programs. He wants an information system that will not only deliver ads over the Web, but one that will also enable him to determine how frequently customers click on those ads. In this case, determining click ratios in near real time will be very expensive; saving the data in a batch and processing it some hours later will be much easier and cheaper.
If you can live with information that is a day or two old, the system will be easier and cheaper to implement.

11) Define relevant information. Explain the importance of relevant information in an organizational context.
Relevant information is information that directly pertains to both the context and to the subject it references. Considering context, you, the CEO, need information that is summarized to an appropriate level for your job. A list of the hourly wage of every employee in the company is unlikely to be useful. More likely, you need average wage information by department or division.
A list of all employee wages is irrelevant in your context.

Information should also be relevant to the subject at hand. If you want information about short-term interest rates for a possible line of credit, then a report that shows 15-year mortgage interest rates is irrelevant.

12) Explain the importance of just barely sufficient information in the information age we live in.
Just barely sufficient information is information that is sufficient for the purpose for which it is generated, but only so. We live in an information age; one of the critical decisions that each of us has to make each day is what information to ignore. The higher you rise into management, the more information you will be given, and because there is only so much time, the more information you will need to ignore. So information should be sufficient, but just barely.

13) What are the costs associated with information? When is information considered to be worth its cost?
Information is not free. There are costs for developing an information system, costs of operating and maintaining that system, and costs of your time and salary for reading and processing the information the system produces. For information to be worth its cost, an appropriate relationship must exist between the cost of information and its value.

14) List the two major benefits of an information system.
The two major benefits of an information system are:
1. Labor savings
2. More data that can be processed for more information

15) What role does an individual's thinking play in the five components of an information system?
When you consider the five components of an information system, the last component, people, includes you. Your mind and your thinking are not merely a component of the information systems you use; they are the most important component. Even if you have the perfect information system, if you do not know what to do with the information that it produces, you are wasting your time and money. The quality of your thinking is a large part of the quality of the information system.

Chapter 3: Organizational Strategy, Information Systems, and Competitive Advantage

Notes from Multiple Choice Questions

The competitive strategy followed by an organization is derived from its **structure**.

The competitive strategy of an organization determines its **value chains**.

In which of the following situations would the suppliers have the strongest bargaining power?
Coffee planters during a season of frost that decreases production

Porter originally developed the five forces model to determine **the potential profitability of an industry**.

Simpson's Lawn Services decides to offer two free mowing services for all customers who booked garden landscaping in the fall. By doing this, which of the following forces is Simpson's addressing?
The threat posed by Roger's Landscapes, a new competitor

Porter's five competitive forces can be grouped into two types: forces related to **competition** and forces related

to supply chain bargaining power.

Porter's model includes the bargaining power of which of the following groups as one of the five factors?
Customers

In Porter's five factor model, each of the three competitive forces concerns the danger of **customers taking their business elsewhere**.

Two strength factors that relate to all three competitive forces are **switching costs** and customer loyalty.

In which of the following cases is the strength of competitive forces low?
When switching costs are high

If customers perceive the benefits of a substitute to be similar to that of a product then **the threat from the substitute is strong**.

The strength of bargaining power forces depends on the availability of substitutes and **the relative size of the firm** compared to the size of suppliers or customers.

An organization responds to the structure of its industry by choosing a **competitive** strategy

If a company produces a uniquely formulated anti-ageing face cream targeted at women above the age of forty, which of the following competitive strategies is it following?
Focused differentiation

Which of the following is an example of a competitive strategy employed by a firm? **Launching a unique product targeted at a section of consumers**

According to Porter, to be effective the organization's goals, objectives, culture, and activities must be consistent with the **organization's strategy**.

Porter defined **value** as the amount of money that a customer is willing to pay for a resource, product, or service.

Which of the following is true of a value-chain?
It is a network of value-creating activities.

A business that selects a differentiation strategy would **add cost to an activity provided it has a positive margin**.

The difference between the value that an activity generates and the cost of the activity is called the **margin**.

Collecting, storing, and physically distributing the product to buyers describes which of the following primary activities?
Outbound logistics

Inducing buyers to purchase the product and providing a means for them to do so describes which of the following primary activities?
Sales and marketing

Each stage of the value chain not only adds value to the product but also **accumulates costs**.

Which of the following is a primary activity in the value chain?
Delivering products to consumers

Firm infrastructure includes general management, finance, accounting, legal, and government affairs.

Porter's model of business activities includes **linkages**, which are interactions across value activities.

Manufacturing systems that include linkages, use **sales forecast** to plan production.

Manufacturing systems use **linkages** to reduce inventory costs.

As Porter says, the processes and systems in an organization pursuing differentiation must **create sufficient value to cover their costs**.

If a value chain's margin is positive, the company must **retain its present practices**.

Organizations gain a competitive advantage by creating new products or services, **enhancing products and services** and by differentiating their products and services from those of their competitors.

Which of the following is a product implementation principle of competitive advantage?
Enhance goods or services

Which of the following strategies is also called establishing high switching costs?
Locking in customers

Which of the following is a process implementation principle of competitive advantage?
Establishing alliances

Which of the following is least likely to be an outcome of organizations forming alliances with each other?
Increase in mutual competitiveness

Essay Questions

1) Briefly describe how organizational strategy determines the structure of information systems.
Organizations examine the structure of their industry and, from that, develop a competitive strategy. That strategy determines value chains, which, in turn, determine business processes. The nature of business processes determines the requirements and functions of information systems.

2) Describe Porter's five forces model.
Organizational strategy begins with an assessment of the fundamental characteristics and structure of an industry. A model used to assess an industry structure is Porter's five forces model. Porter's five competitive

forces can be grouped into two types: forces related to competition and forces related to supply chain bargaining power. The competitive forces are: competition from vendors of substitutes, competition from new competitors, and competition from existing rivals. The bargaining power forces include the bargaining power of suppliers and the bargaining power of customers. The intensity of each of the five forces determines the characteristics of the industry, how profitable it is, and how sustainable that profitability will be. Organizations examine these five forces and determine how they intend to respond to them. That examination leads to competitive strategy.

3) What are the four competitive strategies based on Porter's five forces model?
An organization responds to the structure of its industry by choosing a competitive strategy. Porter followed his five forces model with the model of four competitive strategies. According to Porter, a firm can engage in one of these four fundamental competitive strategies. An organization can focus on being the cost leader, or it can focus on differentiating its products from those of the competition. Further, the organization can employ the cost or differentiation strategy across an industry or it can focus its strategy on a particular industry segment. According to Porter, to be effective the organization's goals, objectives, culture, and activities must be consistent with the organization's strategy.

4) How does competitive strategy determine value chain structure?
Porter defined value as the amount of money that a customer is willing to pay for a resource, product, or service. A value chain is a network of value-creating activities. Organizations analyze the structure of their industry, and, using that analysis, they formulate a competitive strategy. They then need to organize and structure the organization to implement that strategy. If, for example, the competitive strategy is to be a cost leader, then business activities need to be developed to provide essential functions at the lowest possible cost. A business that selects a differentiation strategy would not necessarily structure itself around least-cost activities. Instead, such a business might choose to develop more costly systems, but it would do so only if those systems provided benefits that outweighed their risks.

5) Distinguish between a primary and a support activity in the value chain.
Primary activities are business function that relate directly to the production of the organization's products or services.
Support activities are business functions that assist and facilitate the primary activities.

6) Differentiate between value and margin.
Porter defined value as the amount of money that a customer is willing to pay for a resource, product, or service. The difference between the value that an activity generates and the cost of the activity is called the margin. A business with a differentiation strategy will add cost to an activity only as long as the activity has a positive margin.

7) Describe using an example, the primary activities in a value chain.
In a bicycle manufacturing unit the primary activities of a value chain are followed. The manufacturer acquires raw materials using the inbound logistics activity. This activity concerns the receiving and handling of raw materials and other inputs. The accumulation of those materials adds value in the sense that even a pile of unassembled parts is worth something to some customer. A collection of the parts needed to build a bicycle is worth more than an empty space on a shelf. The value is not only the parts themselves, but also the time required to contact vendors for those parts, to maintain business relationships with those vendors, to order the parts, to receive the shipment, and so forth.

In the operations activity, the bicycle maker transforms raw materials into a finished bicycle, a process that adds more value. Next, the company uses the outbound logistics activity to deliver the finished bicycle to a customer. Of course, there is no customer to send the bicycle to without the marketing and sales value activity. Finally, the service activity provides customer support to the bicycle users.

8) What is a value chain? List the primary activities in a value chain.

A value chain is a network of value-creating activities. The generic value chain developed by Porter consists of five primary activities and three support activities. The primary activities are:

a. In-bound logistics-which deals with receiving, storing, and disseminating inputs to the product

b. Operations-which involves transforming inputs into the final product

c. Out-bound logistics-which deals with collecting, storing, and physically distributing the product to buyers

d. Marketing and sales-which involves inducing buyers to purchase the product and providing a means for them to do so

e. Customer service-which involves assisting customer's use of the product and thus maintaining and enhancing the product's value

9) Explain value chain linkages.

Porter's model of business activities includes linkages, which are interactions across value activities. For example, manufacturing systems use linkages to reduce inventory costs. Such a system uses sales forecasts to plan production; it then uses the production plan to determine raw materials needs and then uses the material needs to schedule purchases. The end result is just-in-time inventory, which reduces inventory sizes and costs.

10) How did Porter define technology, human resources and firm infrastructure?

Porter defined technology broadly. It includes research and development, but it also includes other activities within the firm for developing new techniques, methods, and procedures. He defined human resources as recruiting, compensation, evaluation, and training of full-time and part-time employees. Finally, firm infrastructure includes general management, finance, accounting, legal, and government affairs.

11) Describe the support activities in a value chain.

The support activities in the generic value chain facilitate the primary activities and contribute only indirectly to the production, sale, and service of the product. They include procurement, which consists of the processes of finding vendors, setting up contractual arrangements, and negotiating prices. Porter defined technology broadly. It includes research and development, but it also includes other activities within the firm for developing new techniques, methods, and procedures. He defined human resources as recruiting, compensation, evaluation, and training of full-time and part-time employees. Finally, firm infrastructure includes general management, finance, accounting, legal, and government affairs. Supporting functions add value, albeit indirectly, and they also have costs.

12) What is the criterion on which business processes should run?

According to Porter, whether business processes are low-cost or high-service, these processes and systems must create sufficient value that they will more than cover their costs. If not, the margin of those systems will be negative. If a value chain's margin is negative, the company must make some change. Either the value must be increased, or the costs of the value chain need to be reduced.

13) How can one develop competitive strategies using products? How can information systems help in the process?

Some competitive techniques are created through products and services or created through the development of business processes. There are three principles that concern products and services. Organizations gain a competitive advantage by:
a. creating new products or services
b. enhancing existing products or services
c. differentiating their products and services from those of their competitors
An information system can be part of a product or it can provide support for a product or service.

14) Describe some competitive advantage strategies that are based on business processes.
Some of the competitive strategies that are based on business processes include:
a. Establishing high switching costs-organizations can lock in customers by making it difficult or expensive for customers to switch to another product.
b. Lock in suppliers-organizations can lock in suppliers by making it difficult to switch to another organization, or, stated positively, by making it easy to connect to and work with the organization.
c. Creating entry barriers-competitive advantage can be gained by creating entry barriers that make it difficult and expensive for new competition to enter the market.
d. Establish alliances-another means to gain competitive advantage is to establish alliances with other organizations.
e. Finally, by creating better business processes, organizations can gain competitive advantage by reducing costs.

Chapter 5: Database Processing

Notes from Multiple Choice Questions
The purpose of a database is to **keep track of things that involve more than one thing**.

A **database** is a self-describing collection of integrated records.

Which of the following describes a byte?
A character of data

Characters of data are grouped into **columns.**

Bytes are grouped into columns, which are also called **fields**.

Columns are grouped into **rows**, which are also called **records**.

A collection of fields is called a **record**.

A group of similar rows or records is called a **table**.

A table is also called a **file**.

What is metadata?
Special data that describes the structure of a database

A **key** is a column or group of columns that identifies a unique row in a table.

Columns that are keys of a different table than the one in which they reside are known as **foreign** keys.

Databases that carry their data in the form of tables are called **relational** databases.

A more formal name for a table is **relation**.

Data type and description are examples of **metadata**.

The name of the field, the data type, and the number of characters allowed would be an example of **metadata**.

A **database application system** is an assembly of forms, reports, queries, and application programs that process a database.

DBMS software programs assist in creating and maintaining databases.

Which of the following is a DBMS product from Microsoft?
SQL Server

DB2 is a popular enterprise DBMS from IBM.
Database developers use the **DBMS** to create relationships in the database.

Which of the following is a function of the DBMS?
Processing the database

For which of the following operations do applications use DBMS?
Modify data

Structured Query Language is an international standard language for processing a database.

SQL stands for **Structured Query Language**.

During which of the following functions of a database are tools provided for assistance?
Administering the database

A **database application** is a collection of reports, forms, and queries that process a database.

Data entry forms are used to read, insert, modify, and delete data.

In a typical database application, a **report** shows data in a structured context.

To locate something in the database, one must type in the keyword into the **query form** of the application.

Which of the following is true of database application?
Application programs process logic that is specific to a given business need.

The **lost-update** problem is unique to a multiuser database processing.

Enterprise DBMS process(es) large organizational and workgroup databases.

Personal DBMS products are designed **for smaller, simpler database applications**.

Which of the following is an example of enterprise DBMS?
MySQL

FoxPro is an example of personal DBMS.

Which of the following stands true for enterprise DBMS products?
Enterprise DBMS products support many (perhaps thousands) of users and many different database applications.

Which of the following stands true for personal DBMS products?
Personal DBMS products are designed for simple database applications.

Which of the following is the most significant personal DBMS product available in the market today? **MS Access**
Access is both a DBMS and an application development product.

Essay Questions

1) What are the differences between a spreadsheet and a database?
The purpose of both, a spreadsheet and a database is to keep track of things. However, unlike a spreadsheet, a database offers the solution of being able to keep track of more than one type of data. If the structure of a list is simple enough, there is no need to use database technology. However, lists that involve multiple themes require a database.

2) Describe the contents of a database.
A database is a self-describing collection of integrated records that is organized based on a hierarchy of data elements. A byte is a character of data. Bytes are grouped into columns. Columns are also called fields. A key is a column or group of columns that identifies a unique row in a table. Columns that are keys of a different table than the one in which they reside are called foreign keys. Columns or fields, in turn, are grouped into rows, which are also called records. Finally, a group of similar rows or records is called a table or a file. A database contains, within itself, a description of its contents. Metadata are data that describe data.
Thus, a database is a collection of tables plus relationships among the rows in those tables, plus special data, called metadata, that describes the structure of the database.

3) What are relational databases?
Databases that carry their data in the form of tables that represent relationships using foreign keys are called relational databases. Foreign keys are columns that are keys of a different table than the one in which they reside. (The term relational is used because another, more formal name for a table is relation.) In the past, there were databases that were not relational in format, but such databases have nearly disappeared.

4) Describe the usefulness of metadata.

A database is self-describing in that it contains, within itself, a description of its contents. This is because it contains not only data, but also data about the data in the database. This data is known as metadata. It is the presence of metadata that makes databases much more useful than spreadsheets or data in other lists. Because of metadata, no one needs to guess, remember, or even record what is in the database. To find out what a database contains, we just look at the metadata inside the database.

5) What is the function of a database application system?

A database, all by itself, is not very useful. Pure database data are correct, but in raw form they are not pertinent or useful. A database application system makes database data more accessible and useful. Users employ a database application that consists of forms, formatted reports, queries, and application programs. Each of these, in turn, calls on the database management system (DBMS) to process the database tables.

6) Explain database management systems.

A database management system (DBMS) is a program used to create, process, and administer a database. A DBMS is different from a database in that a DBMS is a software program while a database is a collection of tables, relationships, and metadata.

Almost no organization develops its own DBMS. Instead, companies license DBMS products from vendors such as IBM, Microsoft, Oracle, and others. Popular DBMS products are DB2 from IBM, Access and SQL Server from Microsoft, and Oracle from the Oracle Corporation. Another popular DBMS is MySQL, an open-source DBMS product that is free for most applications.

7) How does one create a database and its structures?

Database developers use the DBMS to create tables, relationships, and other structures in the database. A form is used to define a new table or to modify an existing one. To create a new table, the developer just fills out a new form.

To modify an existing table–for example, to add a new column–the developer opens the metadata form for that table and adds a new row of metadata. For example, the developer adds a new column called "Response?" to a table. This new column has the data type Yes/No, which means that the column can contain only one of the values–Yes or No. The person using this form will use this column to indicate whether he/she has responded to the student's email. Other database structures are defined in similar ways.

8) Describe the functions of a database management system.

A database management system (DBMS) is a program used to create, process, and administer a database.

a. Database developers use the DBMS to create tables, relationships, and other structures in the database. To create a new table, the developer just fills out a new form. To modify an existing table—for example, to add a new column—the developer opens the metadata form for that table and adds a new row of metadata.

b. The second function of the DBMS is to process the database. Applications use the DBMS for four operations: to read, insert, modify, or delete data. The applications call upon the DBMS in different ways. From a form, when the user enters new or changed data, a computer program that processes the form calls the DBMS to make the necessary database changes. From an application program, the program calls the DBMS directly to make the change.

c. A third DBMS function is to provide tools to assist in the administration of the database. Database administration involves a wide variety of activities. For example, the DBMS can be used to set up a security system involving user accounts, passwords, permissions, and limits for processing the database.

d. In addition to security, DBMS administrative functions include backing up database data, adding structures to

improve the performance of database applications, removing data that are no longer wanted or needed, and similar tasks.

9) Define SQL.

Structured Query Language (SQL) is an international standard language for processing a database. All DBMS products accept and process SQL statements. One need not understand or remember SQL language syntax. Instead, realize that SQL is an international standard for processing a database. Also, SQL can be used to create databases and database structures.

10) What is a database application?

A database application is a collection of forms, reports, queries, and application programs that process a database. A database may have one or more applications, and each application may have one or more users. These applications have different purposes, features, and functions, but they all process the same inventory data stored in a common database.

11) Briefly describe the elements of a database application.

A database application is a collection of forms, reports, queries, and application programs that process a database. Data entry forms are used to read, insert, modify, and delete data. Reports show data in a structured context. DBMS programs provide comprehensive and robust features for querying database data. The DBMS provides a facility to type in a keyword into a query form to find what one is looking for.

There are also database application programs for applications that have unique requirements that a simple form, report, or query cannot meet.

12) How are database application programs useful?

Most applications have unique requirements that a simple form, report, or query cannot meet. In such cases, data application programs come into play. Application programs process logic that is specific to a given business need, and enable database processing over the Internet. For this use, the application program serves as an intermediary between the Web server and the database. The application program responds to events, such as when a user presses a submit button; it also reads, inserts, modifies, and deletes database data.

13) How can one prevent the lost-update problem of multiuser processing?

The lost-update problem exemplifies one of the special characteristics of multiuser database processing. To prevent this problem, some type of locking must be used to coordinate the activities of users who know nothing about one another.

14) Explain enterprise DBMS products.

DBMS products fall into two broad categories. One of these categories is enterprise DBMS products that process large organizational and workgroup databases. These products support many (perhaps thousands) of users and many different database applications. Such DBMS products support 24/7 operations and can manage databases that span dozens of different magnetic disks with hundreds of gigabytes or more of data. IBM's DB2, Microsoft's SQL Server, and Oracle's Oracle are examples of enterprise DBMS products.

15) What are personal DBMS products?

DBMS products fall into two broad categories. One of these categories is personal DBMS products which are designed for smaller, simpler database applications. Such products are used for personal or small workgroup applications that involve fewer than 100 users, and normally fewer than 15. In fact, the great bulk of databases in

this category have only a single user. In the past, there were many personal DBMS products - Paradox, dBase, R:base, and FoxPro. Today, the only remaining personal DBMS of significance is Microsoft Access.

Chapter 6: Data Communications

Notes from Multiple Choice Questions

The distinguishing characteristic of a LAN is **that it connects at a single location**.

A **WAN** connects computers at different geographic locations.

The computers in two separate company sites must be connected using a **WAN**.

A **layered protocol** is used to provide seamless flow of data across networks.

A **protocol** is a set of rules that two communicating devices follow.

A **switch** is a special-purpose computer that receives and transmits wired traffic on the LAN.

Each device on the LAN has a hardware component called the **NIC** that connects the device's circuitry to the cable.

Most LAN connections are made using **UTP** cables.

In order for a printer or a laptop to connect to a wireless LAN, it must have a **WNIC**.

The WNIC devices connect to an **access point**, which is the component of the LAN device that processes wireless traffic and communicates with the wired switch.

The IEEE 802.3 protocol standard is also known as **Ethernet**.

Which protocol standard used for wired LAN connections specifies hardware characteristics, such as which wires carry which signals?
Ethernet

Which of the following statements about LAN protocols is true?
The access point uses both the 802.3 and 802.11 standards.

Bluetooth is a common wireless protocol used for transmitting data over short distances.

Which of the following protocols is commonly used by LAN?
IEEE 802.11g

What is the protocol commonly used for wireless LAN?
IEEE 802.11g

Which of the following is true of an ISP?

It serves as a user's gateway to the Internet.

A **modem** must be used to convert a computer's digital data to an analog, or wavy, signal.
Which of the following is true of DSL modems?
Their signals do not interfere with voice telephone service.

What is the performance guarantee offered by SDSL connections?
They offer the same fast speed in both directions.

Most homes and small businesses use **ADSL** because they receive more data than they transmit.

Businesses that need DSL lines that have the same receiving and transmitting speeds would use **SDSL**.

Which of the following is true of cable modems?
The signals from cable modems do not interfere with TV signals.

Narrowband lines typically have transmission speeds less than **56 kbps**.

Which of the following purposes does an HTTP protocol serve?
Enable communication among programs

The S in HTTPS stands for **secure**.

One very common use of FTP is to **maintain websites**.

Which of the following provides reliable internet transport?
TCP

The **web** is the Internet-based network of browsers and servers that process HTTP or HTTPS.

When an individual uses the Internet, but not the Web, he or she is using **FTP**.

What is an IP address?
It is a number that identifies a particular device.

A **domain name** is a unique name that is affiliated with a public IP address.

Which of the following means an address on the internet?
URL

Which of the following is a component of the user tier?
Computers that have browsers that request and process Web pages

In the three-tier architecture arrangement, what is the second tier?
Server tier

A **commerce server** receives requests from users via the Web server, takes some action, and returns a response to the users via the Web server.

Which of the following is true of Web servers?
They send and receive Web pages to and from clients.

HTML is the most common language for defining the structure and layout of Web pages.

What is a VPN?
It uses the Internet to create private point-to-point connections.

Which of the following is true of VPN?
VPN communications are secure even though they are transmitted over the public Internet.

Essay Questions

1) What is the difference between a LAN and a WAN? Give an example of how each one could be used in business.
A local area network (LAN) connects computers that reside in a single geographic location on the premises of the company that operates the LAN. Wide area networks (WANs) connect computers at different geographic locations. The computers in two separated company sites must be connected using a WAN. With a LAN, the number of connected computers can range from two to several hundred, but they are still in a single location (usually within a building or floor of a building). Most small businesses have a LAN in place in their office that connects them. For example: a university campus uses a backbone (usually fiber optic) to connect all the different buildings on the campus and possibly multiple campuses on the university's WAN.

2) What is an NIC? Why is it important to LAN?
Each wired computer or printer on the LAN has a network interface card (NIC), which is a device that connects the computer's or printer's circuitry to the network cables. The NIC works with programs in each device to implement the protocols necessary for communication. Most computers today ship from the factory with an onboard NIC, which is an NIC built into the computer's circuitry.

3) How does a wireless NIC work?
The WNIC devices connect to an access point, which is the component of the LAN device that processes wireless traffic and communicates with the wired switch. Thus, with this design every device on the LAN, whether wired or wireless, can communicate with every other device. Wireless devices communicate to each other via the access point. If wireless devices need to connect to a wired device, they do so via the access point, then to the switch, and then to the wired devices.

Similarly, wired devices communicate to each other via the switch. If the wired devices need to connect to wireless ones, they do so via the switch, then to the access point, and then to the wireless devices.

4) What is Bluetooth? What are its uses?
Bluetooth is a common wireless protocol. It is designed for transmitting data over short distances, replacing cables. Some devices, such as wireless mice and keyboards, use Bluetooth to connect to the computer. Cell phones use Bluetooth to connect to automobile entertainment systems.

5) What are the three important functions of an ISP?
An ISP has three important functions. First, it provides the client with a legitimate Internet address. Second, it serves as a gateway to the Internet. The ISP receives the communications from the client's computer and passes them on to the Internet, and it receives communications from the Internet and passes them on to the client. Finally, ISPs pay for the Internet. They collect money from their customers and pay access fees and other charges on their behalf.

6) Identify the differences between ADSL and SDSL.
DSL lines that have different upload and download speeds are called asymmetric digital subscriber lines (ADSL). Most homes and small businesses can use ADSL because they receive more data than they transmit (e.g., pictures in news stories), and hence they do not need to transmit as fast as they receive.
Some users and larger businesses need DSL lines that have the same receiving and transmitting speeds. They also need performance-level guarantees. Symmetrical digital subscriber lines (SDSL) meet this need by offering the same fast speed in both directions.

7) What are cable modems?
Cable modems provide high-speed data transmission using cable television lines. The cable company installs a fast, high-capacity optical fiber cable to a distribution center in each neighborhood that it serves. At the distribution center, the optical fiber cable connects to regular cable-television cables that run to subscribers' homes or businesses.

Cable modems modulate in such a way that their signals do not interfere with TV signals. Because up to 500 user sites can share these facilities, performance varies depending on how many other users are sending and receiving data. At the maximum, users can download data up to 50 Mbps and can upload data at 512 kbps.

8) What is the IP protocol architecture?
The protocols used on the Internet are arranged according to a structure known as the TCP/IP Protocol (TCP/IP) architecture, which is a scheme of five protocol types arranged in layers. The top layer concerns protocols for applications such as browsers and Web servers. The next two layers concern protocols about data communications across any internet, including the Internet. The bottom two layers involve protocols that concern data transmission within a network. For example, the IEEE 802.3 and 802.11 LAN protocols operate at the bottom two layers.

9) Name some common application layer protocols.
The TCP/IP application layer protocols are common. SMTP, or Simple Mail Transfer Protocol, is used for email transmissions (along with other protocols as well). And FTP, or File Transfer Protocol, is used to move files over the Internet. One very common use for FTP is to maintain Web sites. When a Web site administrator wishes to post a new picture or story on a Web server, the administrator will often use FTP to move the picture or other item to the server.

10) Explain Transmission Control Protocol (TCP).
The most important protocol in the transport layer is TCP, or Transmission Control Protocol. As a transport protocol, TCP has many complicated functions. One easily understood function, is that TCP programs break traffic up into pieces and send each piece along its way. It then works with TCP programs on other devices on the internet to ensure that all of the pieces arrive at their destination. If one or more pieces is lost or damaged, TCP programs detect that condition and cause retransmission of that piece. Hence, the TCP layer is said to

provide reliable internet transport.

11) Differentiate between private and public IP addresses.
Public IP addresses identify a particular device on the public Internet. Because public IP addresses must be unique, worldwide, their assignment is controlled by a public agency known as ICANN (Internet Corporation for Assigned Names and Numbers). Private IP addresses identify a particular device on a private network, usually on a LAN. Their assignment is controlled within the LAN, usually by the device labeled "LAN Device".

12) What is a domain name? What is the procedure to get a domain name?
A domain name is a unique name that is affiliated with a public IP address. When an organization or individual wants to register a domain name, it goes to a company that applies to an ICANN-approved agency to do so. The company will first determine if the desired name is unique, worldwide. If so, then it will apply to register that name to the applicant. Once the registration is completed, the applicant can affiliate a public IP address with the domain name. From that point onward, traffic for the new domain name will be routed to the affiliated IP address.

13) What are the three tiers in the three-tier architecture?
Almost all e-commerce applications use the three-tier architecture, which is an arrangement of user computers and servers into three categories, or tiers. The user tier consists of computers, phones, and other devices that have browsers that request and process Web pages. The server tier consists of computers that run Web servers and process application programs. The database tier consists of computers that run a DBMS that processes SQL requests to retrieve and store data.

14) What is the difference between a web server and a commerce server?
Web servers are programs that run on a server tier computer and that manage HTTP traffic by sending and receiving Web pages to and from clients. A commerce server is an application program that runs on a server tier computer. A commerce server receives requests from users via the Web server, takes some action, and returns a response to the users via the Web server. Typical commerce server functions are to obtain product data from a database, manage the items in a shopping cart, and coordinate the checkout process.

15) What is a VPN and how does it work?
VPN stands for a virtual private network and is an alternative to a WAN. A VPN uses the Internet or a private internet to create the appearance of private point-to-point connections. This connection, called a tunnel, is a virtual, private pathway over a public or shared network from the VPN client to the VPN server.

Chapter 7: Business Process Management

Notes from Multiple Choice Questions

Information silos occur when data are isolated in separated information systems.

Which of the following is true for personal information systems?
Such systems have only one user and hence procedures need not be documented or formalized in any way.

Which of the following is an example of a personal information system?
Contact manager

Which of the following statements of enterprise information systems is true?
It supports 100 to 1000 users.

Which of the following is true for workgroup information systems?
Typically workgroup systems support 10 to 100 users.

Which of the following is an example of a workgroup information system?
Accounts payable system

A Web store front is an example of a **functional information system**.

Which of the following stands true for enterprise information systems?
The solutions to problems in an enterprise system usually involve more than one department.

Interenterprise information systems are information systems that are shared by two or more independent organizations.

Ordering of restaurant supplies from suppliers is an example of an interenterprise information system.

Information silos arise as a result of **an organization's growth and increasing use of information systems**

An information silo is also known as an **island of automation**.

Which of the following applications falls under the common departmental information system of sales and marketing?
Lead generation

As a common departmental information system, **Operations** includes order management.

Planning and scheduling are applications that fall under **manufacturing**.

Order tracking and account tracking are applications of **customer service**.

Compensation is an application of the human resources department.

The summation of all the problems of information silos leads to **increased costs for the organization**.

Which of the following is a consequence of isolated information systems?
There is a lack of integrated enterprise information.

Business process reengineering is the activity of altering and designing business processes to take advantage of new information systems.

Which of the following is true for business process reengineering?
In the process of business process reengineering, systems analysts need to interview key personnel

throughout the organization to determine how best to use the new technology.

Inherent processes are predesigned procedures for using the software products.

A **customer relationship management system** is a suite of applications, a database, and a set of inherent processes for managing all the interactions with the customer, from lead generation to customer service.

Which of the following sentences is true about customer relationship management system (CRM)?
CRM systems vary in the degree of functionality they provide.

The first step of the customer life cycle is marketing which involves **sending messages to the target audience to attract customer prospects**.

When prospects become customers who need to be supported, the organization is in the **customer acquisition** stage of the customer life cycle.

Which of the following is a component of relationship management?
Increasing the value of existing customers by selling them more product

During which stage of the customer life cycle do win-back processes categorize customers according to value?
Loss

Churning is the last stage of the customer life cycle.

Enterprise resource planning is a suite of applications, a database, and a set of inherent processes for consolidating business operations into a single, consistent, computing platform.

Which of the following is true about enterprise resource planning (ERP)?
ERP systems are used to forecast sales and to create manufacturing plans and schedules to meet those forecasts.

SAP is the worldwide leader of ERP vendors.

EAI is a suite of software applications that integrates existing systems by providing layers of software that connect applications together.

Which of the following is a function of EAI?
It enables a gradual move to ERP

Which of the following statements is true of EAI?
EAI leverages existing systems—leaving functional applications as is, but providing an integration layer over the top.

When implementing new enterprise systems, the only solution for resolving process issues and providing enterprise process management is **establishing clear and absolute contractual guidelines**.

Gap identification is a major task when implementing enterprise systems.

Which of the following is true about the challenges of requirements gaps?
To specify a gap, an organization must know both what it needs and what the new product does.

Self-efficacy is a person's belief that he or she can be successful at his or her job.

Essay Questions

1) What are personal information systems?
Personal information systems are information systems used by a single individual. The contact manager in an iPhone or in an email account is an example of a personal information system. Because such systems have only one user, procedures are simple and probably not documented or formalized in any way.

It is easy to manage change to personal information systems. Because there is a sole user of the new system, if new procedures are required, only one person needs to adapt. And, if there are problems, he/ she can solve the problems themselves.

2) Explain workgroup information systems.
A workgroup information system is an information system that is shared by a group of people for a particular purpose. For example, the personnel who maintain golf courses, club lawns, and gardens share a workgroup information system for scheduling tasks and employees to accomplish those tasks.

Workgroup information systems that support a particular department are sometimes called departmental information systems. An example is the accounts payable system that is used by the accounts payable department. Other workgroup information systems support a particular business function and are called functional information systems. An example of a functional system is a Web storefront.

Typically workgroup systems support 10 to 100 users. The procedures for using them must be understood by all members of the group. Often, procedures are formalized in documentation, and users are sometimes trained in the use of those procedures. When problems occur, they almost always can be solved within the group.

3) What are enterprise information systems?
Enterprise information systems are information systems that span an organization and support activities in multiple departments. For example, at a country club resort, the restaurant, the golf courses, the wedding events departments all use the same enterprise information system to record sales.

Enterprise information systems typically have hundreds to thousands of users. Procedures are formalized and extensively documented; users undergo formal procedure training. Sometimes enterprise systems include categories of procedures, and users are defined according to levels of expertise with the system as well as by levels of security authorization.

The solutions to problems in an enterprise system usually involve more than one department. Because enterprise systems span many departments and involve potentially thousands of users, they are very difficult to change. Changes must be carefully planned, cautiously implemented, and users given considerable training. Sometimes users are given incentives and other inducements to motivate them to change.

4) Explain interenterprise information systems.
Interenterprise information systems are information systems that are shared by two or more independent organizations. At a club house, for example, the information system that a restaurant uses to order supplies and ingredients from its suppliers is an interorganizational system. Because such systems are used by employees of different organizations, procedures are formalized and user training is mandatory.

Such systems typically involve thousands of users, and solutions to problems require cooperation among different, usually independently owned, organizations. Problems are resolved by meeting, contract, and sometimes by litigation.

Data are often duplicated between organizations, but such duplication is carefully managed. Because of the wide span, complexity, and multiple companies involved, such systems can be exceedingly difficult to change. The interaction of independently owned and operated information systems is required.

5) What are information silos?
Information silos are a condition that exists when data are isolated in separated information systems. Isolated systems are referred to as silos, because when drawn in diagrams they appear as long vertical columns–like grain silos.

Information silos are created over time, as information systems are implemented to support personal and workgroup applications. As organizations grow, however, at some point such silos will duplicate data and become a source of potentially serious problems.

6) What are common departmental applications?
Common departmental applications are systems created to support a given department's information processing needs. They work fine for those departments. For example, the sales and accounting department of a company handles applications like lead generation and sales forecasting and the manufacturing department of an organization handles applications like inventory, planning, scheduling, etc. However, functional applications duplicate large amounts of data and are likely to cause problems.

7) What problems do information silos cause?
As organizations grow, information silos will eventually duplicate data and become a source of potentially serious problems. First, data are duplicated because each application has its own database. If, for example, accounting and sales/marketing applications are separated, customer data will be duplicated and may become inconsistent. Changes to customer data made in the sales/marketing application may take days or weeks to reach the accounting application's database. During that period, shipments will reach the customer without delay, but invoices will be sent to the wrong address.

Next, when applications are isolated, business processes are disjointed. A consequence of such disjointed systems is the lack of integrated enterprise information. For example, suppose sales and marketing wants to know if XYZ is still a preferred customer. Suppose that determining whether this is so requires a comparison of order history and payment history data. However, with information silos, that data will reside in two different databases and, in one of them, XYZ is known by the name of the company that acquired it. Data integration will be difficult. Making the determination will require manual processes and days, when it should be readily answered in seconds.

This leads to the fourth consequence: inefficiency. When using isolated functional applications, decisions are made in isolation. Without integration, the left hand of the organization doesn't know what the right hand of the organization is doing.

Finally, information silos can result in increased cost for the organization. Duplicated data, disjointed systems, limited information, and inefficiencies all mean higher costs.

8) What are the ways of eliminating duplicate data?

The fundamental problem of information silos is data that are duplicated and stored in isolated systems. The most obvious fix is to eliminate that duplicated data by storing a single copy of data in a shared database and revising business processes (and applications) to use that database. For this, a database should be created. Then each department should alter its business processes (and applications) to use the shared database. Another remedy is to allow the duplication, but to manage it to avoid problems.

9) What is business process reengineering?

Business process reengineering is the activity of altering and designing business processes to take advantage of new information systems. Unfortunately, business process reengineering is difficult, slow, and exceedingly expensive. Systems analysts need to interview key personnel throughout the organization to determine how best to use the new technology. Because of the complexity involved, such projects require high-level and expensive skills and considerable time. Many early projects stalled when the enormity of the project became apparent. This left some organizations with partially implemented systems that had disastrous consequences. Personnel didn't know if they were using the new system, the old system, or some hacked-up version of both.

10) What are inherent processes?

Inherent processes are predesigned procedures for using software products. They save organizations from expensive and time-consuming business process reengineering. Organizations could license the software and obtain, as part of the deal, prebuilt procedures. There are three categories of such inherent processes: customer relationship management; enterprise resource planning, and enterprise application integration.

11) Write a short note on customer relationship management system (CRM).

A customer relationship management system (CRM) is a suite of applications, a database, and a set of inherent processes for managing all the interactions with the customer, from lead generation to customer service. Every contact and transaction with the customer is recorded in the CRM database. Vendors of CRM software claim using their products makes the organization customer-centric. Though that term reeks of sales hyperbole, it does indicate the nature and intent of CRM packages.

12) Explain the four phases of the customer life cycle.

The four phases of the customer life cycle are marketing, customer acquisition, relationship management, and loss/churn. Marketing sends messages to the target market to attract customer prospects. When prospects order, they become customers who need to be supported. Additionally, relationship management processes increase the value of existing customers by selling them more product. Inevitably, over time the organization loses customers. When this occurs, win-back processes categorize customers according to value and attempt to win back high-value customers.

13) What is ERP?

Enterprise resource planning (ERP) is a suite of applications, a database, and a set of inherent processes for

consolidating business operations into a single, consistent, computing platform. ERP includes the functions of CRM, but also incorporates accounting, manufacturing, inventory, and human resources applications.

ERP systems are used to forecast sales and to create manufacturing plans and schedules to meet those forecasts. Manufacturing schedules include the use of material, equipment, and personnel and thus need to incorporate inventory and human resources applications. Because ERP includes accounting, all of these activities are automatically posted in the general ledger and other accounting applications.

14) Describe enterprise application integration.

Companies for which enterprise resource planning is inappropriate still have the problems of information silos, however, and some choose to use enterprise application integration (EAI) to solve those problems. EAI is a suite of software applications that integrates existing systems by providing layers of software that connect applications together.

Although there is no centralized EAI database, the EAI software keeps files of metadata that describe where data are located. Users can access the EAI system to find the data they need. In some cases, the EAI system provides services that provide a "virtual integrated database" for the user to process.

The major benefit of EAI is that it enables organizations to use existing applications while eliminating many of the serious problems of isolated systems. Converting to an EAI system is not nearly as disruptive as converting to ERP, and it provides many of the benefits of ERP. Some organizations develop EAI applications as a steppingstone to complete ERP systems.

15) What cause the challenges that occur while implementing new enterprise systems?

Implementing new enterprise systems is challenging, difficult, expensive, and risky. It is not unusual for enterprise system projects to be well over budget and a year or more late in delivery. The expense and risks arise from four primary factors: collaborative management, requirements gaps, transition problems, and employee resistance.

Unlike departmental systems in which a single department manager is in charge, enterprise systems have no clear boss. Even the discharge process is a collaborative effort among many departments (and customers). Hence, the enterprise should develop committees and steering groups for providing enterprise process management. Although this can be an effective solution, and in fact may be the only solution, the work of such groups is both slow and expensive.

Few organizations today create their own enterprise systems from scratch. Instead, they license an enterprise product that provides specific functions and features and that includes inherent procedures. But, such licensed products are never a perfect fit. Almost always there are gaps between the requirements of the organization and the capabilities of the licensed application. Identifying these gaps and deciding what to do with these gaps can be very challenging.

Transitioning to a new enterprise system is also difficult. The organization must somehow change from using isolated departmental systems to using the new enterprise system, while continuing to run the business. Transitions require careful planning and substantial training. Inevitably, problems will develop. Knowing this will occur, senior management needs to communicate the need for the change to the employees and then stand behind the new system as the kinks are worked out. It is an incredibly stressful time for all involved employees.

People resist change for various reasons. Change requires effort and it engenders fear. Hence, senior-level management needs to communicate the need for the change to the organization and must reiterate that, as necessary, throughout the transition process. To enhance confidence, employees need to be trained and coached on the successful use of the new system. Also, employees may need to be given extra inducement to change to the new system.

Implementing new enterprise systems can solve many problems and bring great efficiency and cost savings to an organization, but it is not for the faint of heart.

Chapter 8: E-Commerce, Web 2.0, and Social Networking

Notes from Multiple Choice Questions

E-commerce is the buying and selling of goods and services **over private and public computer networks**.

Which of the following has enabled thin-client applications to have considerable functionality?
Increased capabilities of browsers

Which of the following is true of Web 2.0?
It makes use of user-generated content and is flexible.

Which of the following was a supporting technology of pre-Internet systems?
EDI

Enterprise 2.0 is the application of Web 2.0 technologies, collaboration systems, social networking, and related technologies to facilitate the cooperative work of intellectual workers in organizations.

Emergence is a key principle of Enterprise 2.0.

Which of the following is true of Social CRM?
Customers control their relationships with the company.

Service-oriented architecture is a software design methodology related to interorganizational program-to-program communication.

The U.S. Census Bureau defines **merchant companies** as companies that take title to the goods they sell.

Nonmerchant companies **arrange for the purchase and sale of goods**.

Sales between a supplier and a retail consumer are **B2C** transactions.

Jackson Enterprises sells products online to the state-run Environmental Protection Agency. This is a **B2G** transaction.

Amazon.com, REI.com, and LLBean.com are examples of companies that use **B2C** information systems.

In a typical distribution system, raw material suppliers sell to manufacturers, manufactures sell to distributors, and distributors sell to retailers. All these transactions are categorized as **B2B** transactions.

Traditional B2C information systems rely on a **Web storefront** that customers use to enter and manage their orders.
Which of the following nonmerchant e-commerce companies supports a competitive bidding process?
Auctions

Clearinghouses provide goods and services at a stated price and arrange for the delivery of the goods, but they never take title.

Using e-commerce to buy directly from the manufacturer eliminates the middlemen in the supply chain. Which of the following terms best explains this elimination?
Disintermediation

Price elasticity measures the amount that demand rises or falls with changes in price.

When a business engages in e-commerce, the manufacturer may be able to offer a lower price and still make a profit, which may cause price conflicts with its traditional channel members. The ability of the manufacturer to offer a lower price and still make a profit is largely attributed to **disintermediation**.

When HP Computers began to sell directly to the public, some retailers resented the competition and stopped carrying HP products in their stores. This is an example of **channel conflict**.

Which of the following expenses are likely to increase for manufacturers who use e-commerce to sell directly to consumers?
Customer-service expenses

Web 2.0 companies **provide software as a free service**.

Web 2.0 applications **are downloaded as Silverlight code**.

Traditional software companies rely on **software license fees** for revenue

In the Web 2.0 world, the value of a site increases **with users and use**.

In the Web 2.0 world, no marketing is done. New product features are released and vendors wait for users to spread the news to one another, one friend sending a message to many friends; most of whom send that message, in turn, to their friends; and so forth, in a process called **viral marketing**.

On some sites, users can provide customer support to one another, or even participate in the creation of product specifications, designs, and complete products in a process called **crowdsourcing**.

Traditional sites are about **publishing**; Web 2.0 is about **participation**.

When the output from two or more Web sites is combined into a single user experience it is called a **mashup**.

Google pioneered Web 2.0 advertising. With its **AdWords** software, vendors pay Google a certain amount for particular search words.

A **social network** is a structure of individuals and organizations that are related to each other in some way.

Karl Marx defined **capital** as the investment of resources for future profit.

Which of the following is an example of human capital?
Knowledge and skills

Being linked to a network of highly regarded contacts is a form of social **credential**.

Which of the following is true about social capital?
The people you know the least contribute the most connections to your network.

A **folksonomy** is a content structure that has emerged from the processing of many user tags.

Which of the following are the characteristics of Enterprise 2.0, according to McAfee?
Search, links, authoring, tags, extensions, signals

According to McAfee, Enterprise 2.0 workers want applications that enable them to rate tagged content and to use the tags to predict content that will be of interest to them. This refers to which of the following characteristics of Enterprise 2.0?
Extensions

In Enterprise 2.0, pushing enterprise content to users based on subscriptions and alerts is part of **signaling**, according to McAfee's Enterprise 2.0 model.

Essay Questions

1) What is e-commerce?
E-commerce is the buying and selling of goods and services over public and private computer networks. E-commerce became feasible with the creation and widespread use of HTTP, HTML, and server applications such as Web storefronts that enabled browser-based transactions. E-commerce was not only faster than pre-Internet commerce, it also brought vendors closer to their customers, and in the process changed market characteristics and dynamics.

2) What is Enterprise 2.0?
Enterprise 2.0 is the application of Web 2.0 technologies, collaboration systems, social networking, and related technologies to facilitate the cooperative work of intellectual workers in organizations. Emergence is a key principle of Enterprise 2.0. Neither relationships nor ideas nor projects are predefined. Instead, they emerge as a result of collaboration via social networking.

3) What is meant by service-oriented architecture (SOA)?
Enterprise 2.0 and Social CRM have given a boost to service-oriented architecture (SOA), which is a software

design methodology and set of program communication standards that greatly improve the flexibility and adaptability of interorganizational program-to-program communication. SOA standards are meta, metadata. They are standards for defining how interprogram communication metadata are to be created.

4) What is an e-commerce auction? Give an example of an e-commerce company.

E-commerce auctions match buyers and sellers by using an e-commerce version of a standard auction. This e-commerce application enables the auction company to offer goods for sale and to support a competitive-bidding process. The best-known auction company is eBay, but many other auction companies exist; many serve particular industries.

5) What is a clearinghouse? Explain with the help of an example.

Clearinghouses provide goods and services at a stated price and arrange for the delivery of the goods, but they never take title. As a clearinghouse, Amazon.com matches the seller and the buyer and then takes payment from the buyer and transfers the payment to the seller, minus a commission. eBay operates in the same manner. Another type of clearinghouse is an electronic exchange that matches buyers and sellers; the business process is similar to that of a stock exchange. Sellers offer goods at a given price through the electronic exchange, and buyers make offers to purchase over the same exchange. Price matches result in transactions from which the exchange takes a commission.

6) What is disintermediation?

Disintermediation is the elimination of the middle layers within a supply chain. This means that the manufacturer eliminates the distributors, wholesalers, and retailer by selling directly to the consumers. This eliminates inventory-carrying costs, shipping overhead, and handling activity. Because the distributor and associated inventories have become unnecessary waste, disintermediation increases market efficiency.

7) How is e-commerce related to price elasticity?

From the seller's side, e-commerce produces information about price elasticity that has not been available before. Price elasticity measures the amount that demand rises or falls with changes in price. Using an auction, a company can learn not just what the top price for an item is, but also the second, third, and other prices from the losing bids. In this way, the company can determine the shape of the price elasticity curve. Similarly, e-commerce companies can learn price elasticity directly from experiments on customers.

8) What kind of marketing is used for Web 2.0 applications?

In the Web 2.0 world, new product features are released and vendors wait for users to spread the news to one another, one friend sending a message to many friends; most of whom send that message, in turn, to their friends; and so forth, in a process called viral marketing. Users carry the message to one another. In fact, if a product requires advertising to be successful, then it is not a Web 2.0 product.

9) What are mashups? Explain with the help of an example?

Web 2.0 encourages mashups, which result when the output from two or more Web sites is combined into a single user experience. Google's My Maps is an excellent mashup example. Google publishes Google Maps and provides tools for users to make custom modifications to those maps. Thus, users mash the Google map product with their own knowledge. In Web 2.0 fashion, Google provides users a means for sharing their mashed-up map over the Internet and then indexes that map for Google search.

10) How does social capital add value?

Relationships in social networks can provide information about opportunities, alternatives, problems, and other factors important to business professionals. They also provide an opportunity to influence decision makers in one's employer or in other organizations who are critical to your success. Such influence cuts across formal organizational structures such as reporting relationships. Third, being linked to a network of highly regarded contacts is a form of social credential. Finally, being linked into social networks reinforces a professional's image and position in an organization or industry.

11) How is the value of social capital determined?

The value of social capital is determined by the number of relationships in a social network, by the strength of those relationships, and by the resources controlled by those related.

12) What are the six characteristics of Enterprise 2.0?

McAfee defined six characteristics of Enterprise 2.0, which he refers to by the acronym SLATES acronym. Workers want to be able to s*earch* for content inside the organization just like they do on the Web. Most workers find that searching is more effective than navigating content structures such as lists and tables of content. Workers want to access organizational content by *link*, just as they do on the Web. They also want to *author* organizational content using blogs, wikis, discussion groups, published presentations, and so forth. Enterprise 2.0 content is *tagged*, just like content on the Web, and tags are organized into structures. Additionally, Enterprise 2.0 workers want applications to enable them to rate tagged content and to use the tags to predict content that will be of interest to them, a process McAfee refers to as *extensions*. Finally, Enterprise 2.0 workers want relevant content pushed to them; they want to be *signaled* when something of interest to them happens in organizational content.

13) What is a folksonomy?

Enterprise 2.0 content is tagged, just like content on the Web, and tags are organized into structures. These structures organize tags as a taxonomy does, but, unlike taxonomies, they are not preplanned; they emerge. A folksonomy is a content structure that has emerged from the processing of many user tags.

14) What is Social CRM?

Social CRM is customer relationship management done in the style of Enterprise 2.0. The relationships between organizations and customers emerge as both parties create and process content. In addition to the traditional forms of promotion, employees in the organization create wikis, blogs, discussion lists, FAQs, sites for user reviews and commentary, and other dynamic content. Customers search this content, contribute reviews and commentary, tag content, ask more questions, create user groups, and so forth. With Social CRM, each customer crafts its own relationship with the company.

15) What is the difference between traditional CRM and Social CRM?

In Social CRM, because relationships emerge from joint activity, customers have as much control as companies. This characteristic is anathema to traditional sales managers who want control over what the customer is reading, seeing, and hearing about the company and its products. Further, traditional CRM is centered on lifetime value; customers who are likely to generate the most business get the most attention and have the most impact on the organization. But, with Social CRM, the customer who spends 10 cents but who is an effective reviewer, commentator, or blogger can have more influence than the quiet customers who purchase $10 million a year. Such imbalance is incomprehensible to traditional sales managers.

Chapter 9: Business Intelligence and Information Systems for Decision Making

Notes from Multiple Choice Questions

Business intelligence is information containing patterns, relationships, and trends.

One **kilobyte** is equal to 10^3 bytes.

A type written page is about 2 **kilobytes**.

A petabyte consists of $\mathbf{10^{15}}$ bytes.

One **exabyte** is equal to 10^{18} bytes

Reporting systems integrate data from multiple sources, and they process that data by sorting, grouping, summing, averaging, and comparing.

Reporting systems improve decision making by **providing the right information to the right user at the right time**.

Decision tree analysis is a technique used by **data-mining** systems.

Data-mining systems improve decision making by using the discovered patterns and relationships to anticipate events or to predict future outcomes.

Market-basket analysis computes the correlation of items on past orders to determine items that are frequently purchased together.

The advantage that **knowledge management systems** have over the other systems is that these foster innovation, improve customer service, increase organizational responsiveness, and reduce costs.

Which of the following systems use If/Then rules?
Expert systems

If Patient_Temperature > 103, Then Initiate High_Fever–Procedure. This sort of a rule is most likely to be found in an **expert** system.

Problematic data are termed as **dirty data**.

WhyMe@GuessWhoIAM.org is an example of **dirty data**.

Which of the following is a problem commonly associated with operational data that have been gathered over time?
Inconsistent

Data granularity refers to the degree of summarization or detail.

Coarse data is highly summarized.

Clickstream data is **too fine**.

Generally, it is better to have data that is **too fine** than data that is **too coarse**.

The more attributes there are, the easier it is to build a model that fits the sample data but that is worthless as a predictor. Which of the following best explains this phenomenon?
The curse of dimensionality

A **data aggregator** is a company that obtains data from public and private sources and stores, combines, and publishes it in sophisticated ways.

The purpose of a **data warehouse** is to extract and clean data from operational systems and other sources, and to store and catalog that data for processing by BI tools.

Which of the following is true for data warehouses?
Data are stored in a data warehouse database using a data warehouse DBMS.

The facts about data, such as its source, format, assumptions, constraints, and the like, are called **metadata**.

A **data mart** is a data collection that is created to address the needs of a particular business

Data warehouses are comparable to distributors in a supply chain because they take data from the data manufacturers, clean and process the data, and locate the data on the disks of its computers.

Data mining is the application of statistical techniques to find patterns and relationships among data and to classify and predict.

Which term is used as a synonym for data mining?
Knowledge discovery in databases

In unsupervised data mining analysts do not create a model or hypothesis before running the analysis.

In **cluster analysis**, statistical techniques identify groups of entities that have similar characteristics.

Cluster analysis is a common unsupervised data-mining technique.

With **supervised** data mining, data miners develop a model prior to the analysis and apply statistical techniques to data to estimate parameters of the model.

Regression analysis is used in **data-mining systems**.
Regression analysis measures the impact of a set of variables on another variable.

Neural networks are a data-mining technique used to predict values and make classifications, such as "good prospect" or "poor prospect" customers.

Essay Questions

1) What is the difference between a megabyte and a gigabyte?

A gigabyte is a bigger than a megabyte. A megabyte is equal to 1,000,000 bytes while a gigabyte equals 1,000,000,000 bytes.

2) What is a business intelligence system?

A business intelligence (BI) system is an information system that provides information for improving decision making. BI systems vary in their characteristics and capabilities and in the way they foster competitive advantage. There are four categories of BI systems: reporting systems, data mining systems, knowledge management systems, and expert systems.

3) Describe the characteristics and advantages of reporting systems.

Reporting systems integrate data from multiple sources, and they process that data by sorting, grouping, summing, averaging, and comparing. Such systems format the results into reports and deliver those reports to users. Reporting systems improve decision making by providing the right information to the right user at the right time.

4) Explain the characteristics and advantages of data mining systems.

Data mining systems process data using sophisticated statistical techniques, such as regression analysis and decision tree analysis. Data mining systems find patterns and relationships that cannot be found by simpler reporting operations, such as sorting, grouping, and averaging. Data mining systems improve decision making by using the discovered patterns and relationships to anticipate events or to predict future outcomes.

Market-basket analysis is a data mining system, which computes correlations of items on past orders to determine items that are frequently purchased together.

5) What are the characteristics and advantages of knowledge management systems?

Knowledge management (KM) systems create value from intellectual capital by collecting and sharing human knowledge of products, product uses, best practices, and other critical knowledge with employees, managers, customers, suppliers, and others who need it. It improves decisions by publishing employee and others' knowledge. This system creates value from existing intellectual capital and fosters innovation, improves customer service, increases organizational responsiveness, and reduces costs.

6) Write a brief note on the characteristics and advantages of expert system.

Expert systems encapsulate the knowledge of human experts in the form of *If/Then* rules and

process those rules to make a diagnosis or recommendation. These systems improve decision making by nonexperts by encoding, saving, and processing expert knowledge. Although few expert systems have demonstrated a capability equivalent to a human expert, some are good enough to considerably improve the diagnosis and decision making of nonexperts.

7) What is dirty data?

Data from transaction processing and other operational systems can be processed to create basic reports without problem. However, raw operational data is seldom suitable for more sophisticated reporting or data mining. First, although data that are critical for successful operations must be complete and accurate, data that are only

marginally necessary do not need to be. For example, some systems gather demographic data in the ordering process. But because such data are not needed to fill, ship, and bill orders, their quality suffers. Such problematic data is known as dirty data.
Examples of dirty data are values of B for customer gender and of 213 for customer age. Other examples are a value of 999-999-9999 for a U.S. phone number, a part color of green, and an email address of WhyMe@GuessWhoIAM.org. All of these values can be problematic for data mining purposes.

8) What is data granularity?
Data can be too fine or too coarse. Data granularity refers to the degree of summarization or detail. Coarse data are highly summarized; fine data express precise details. Generally, it is better to have too fine a granularity than too coarse. If the granularity is too fine, the data can be made coarser by summing and combining. If the granularity is too coarse, however, there is no way to separate the data into constituent parts.

9) Explain clickstream data.
Clickstream data is that data which is captured from customers' clicking behavior. These data are very fine and include everything a customer does at the Web site. Because the data are too fine, the data analysts must throw away millions and millions of clicks.

10) Explain the curse of dimensionality.
The curse of dimensionality is associated with the problem of data having too many attributes. Suppose there are too many attributes from the internal customer data as well as the customer data that has been purchased. To be able to select among them, the curse of dimensionality says that the more attributes there are, the easier it is to build a model that fits the sample data but that is worthless as a predictor.

11) What is the purpose of a data warehouse?
The purpose of a data warehouse is to extract and clean data from operational systems and other sources, and to store and catalog that data for processing by BI tools. The prepared data are stored in a data warehouse database using a data warehouse DBMS, which can be different from the organization's operational DBMS.

12) How is a data warehouse different from a data mart?
The purpose of a data warehouse is to extract and clean data from operational systems and other sources, and to store and catalog that data for processing by BI tools. In a way, one can think of a data warehouse as a distributor in a supply chain. The data warehouse takes data from the data manufacturers (operational systems, other internal systems, etc.), cleans and processes the data, and locates the data on its shelves, so to speak—that is, on the disks of the data warehouse computers. The people who work with a data warehouse are experts at data management, data cleaning, data transformation, metadata design, and the like. Data warehouse business analysts know the general needs of the business, but they are not experts in a given business function.

A data mart is a data collection, smaller than the data warehouse, that addresses a particular component or functional area of the business. If the data warehouse is the distributor in a supply chain, then a data mart is like a retail store in a supply chain. Users in the data mart obtain data that pertain to a particular business function from the data warehouse. Such users do not have the data management expertise that data warehouse employees have, but they are knowledgeable analysts for a given business function.

13) What is data mining?
Data mining is the application of statistical techniques to find patterns and relationships among data and to

classify and predict. Data mining techniques emerged from statistics and mathematics and from artificial intelligence and machine-learning fields in computer science. As a result, data mining terminology is an odd blend of terms from these different disciplines. Sometimes people use the term knowledge discovery in databases (KDD) as a synonym for data mining. Most data mining techniques are sophisticated, and many are difficult to use. Data mining techniques fall into two broad categories: unsupervised and supervised.

14) What is unsupervised data mining?
Unsupervised data mining is where analysts do not create a model or hypothesis before running the analysis. Instead, they apply the data mining technique to the data and observe the results. With this method, analysts create hypotheses after the analysis to explain the patterns found. Findings are obtained solely by data analysis.
One common unsupervised technique is cluster analysis. With it, statistical techniques identify groups of entities that have similar characteristics. A common use for cluster analysis is to find groups of similar customers from customer order and demographic data.

15) Explain supervised data-mining and list the techniques used in it.
With supervised data mining, data miners develop a model prior to the analysis and apply statistical techniques to data to estimate parameters of the model. For example, suppose marketing experts in a communications company believe that cell phone usage on weekends is determined by the age of the customer and the number of months the customer has had the cell phone account. A data-mining analyst would then run an analysis that estimates the impact of customer and account age.

One technique that measures the impact of a set of variables on another variable is called a regression analysis. Neural networks are another popular supervised data mining technique used to predict values and make classifications, such as "good prospect" or "poor prospect" customers.

Chapter 10: Information Systems Development

Notes from Multiple Choice Questions

The process of creating and maintaining information systems is called **systems development**.

Compared to program development, systems development is **broader in scope**.

Systems development requires coordinated teamwork of both specialists and nonspecialists with business knowledge.

Information systems are never **off-the-shelf**.

The bigger the system and the longer the project, **the more the requirements change**.

According to Brooks' Law, adding more people to a late project **makes the project later**.

Adding more people to a late systems development project will make the project later because **training new people slows down team members**.

As development teams become larger, the average contribution per worker **decreases**.

As staff size increases, **more** meetings and coordination activities are required to keep everyone in sync.

Developers in the **system definition** phase of the SDLC use management's statement of the system needs, in order to begin the process of developing a new information system.

The **systems development life cycle (SDLC)** approach is the classical process used to develop information systems.

The initial step in the first phase of the SDLC is to **define the goals and scope of the new system**.

The step in the SDLC process that aims to eliminate obviously nonsensible projects is **Assess project feasibility.**

Organizational feasibility concerns whether the new information system fits within a company's customs, culture, charter, or legal requirements.

Systems analysts are IT professionals who understand both business and technology.

Which of the following statements is true regarding the composition of the development team over the life of the SDLC?
During requirements definition, the team will be heavy with systems analysts.

The primary purpose of the requirements analysis phase is to **determine and document the specific features and functions of the new system**.

Determining the system's requirements is the most important phase in the systems development process.

During the requirements analysis phase of the SDLC, the development team will create a **data model** in case the new system involves a new database or substantial changes to an existing database.

Requirements include what is to be produced, as well as how frequently and how fast it is to be produced.

The easiest and cheapest time to alter the information system is in the **requirements analysis** phase of the SDLC.

In terms of software design, for **off-the-shelf software**, the team must determine candidate products and evaluate them against the requirements while for **custom-developed programs**, the team produces design documentation for writing program code.

Normal processing procedures for system users are procedures for using the system to accomplish business tasks.

Normal processing procedures for operations personnel are procedures for starting, stopping, and running the system.

During the **implementation** phase of the SDLC process, developers construct, test, and install the components of

the information system.

A **test plan** should cause every line of program code to be executed.

Beta testing is the process of allowing future system users to try out the new system on their own.

Products in the beta test phase **are generally fully functioning**.

Users have the final say on whether a system is ready.

System conversion refers to the process of moving the business activity from an old information system to a new system.

The advantage of **pilot** installation is that if the system fails, the failure is contained within a limited boundary.

In a **parallel** installation, the new system runs alongside the old one until it has been tested and is fully operational.

Parallel installation is the **slowest** style of installation.
Because of the significant risks involved, organizations should avoid the **plunge** conversion style if possible.

Which of the following statements is true with regard to system maintenance?
All commercial software products are shipped with known failures.

Software developers group fixes for high priority failures into a **patch** that can be applied to all copies of a given product.

Software vendors usually bundle fixes of low-priority problems into **service packs**.

One of the reasons for SDLC problems is due to the **waterfall** nature of the SDLC. This implies that the systems development process is supposed to operate in a sequence of nonrepetitive phases.

Projects that spend so much time **documenting requirements** are sometimes said to be in analysis paralysis.

Essay Questions

1) What is systems development? How is it different from program development?
Systems development is the process of creating and maintaining information systems. Systems development has a broader scope than computer program development as it involves all five components: hardware, software, data, procedures, and people. Developing a computer program, on the other hand, mostly involves software programs, with some focus on data and databases.

Compared to program development, systems development requires more than just programming or technical expertise. Establishing the system's goals, setting up the project, and determining requirements require business knowledge and management skill. Tasks like building computer networks and writing computer programs require technical skills. Creating data models requires the ability to interview users and understand their view of the business activities. Designing procedures, especially those involving group action, requires business

knowledge and an understanding of group dynamics. Developing job descriptions, staffing, and training all require human resource and related expertise.

Thus, unlike program development, systems development is not an exclusively technical task undertaken by programmers and hardware specialists. Rather, it requires coordinated teamwork of both specialists and nonspecialists with business knowledge.

2) Why is systems development difficult and risky?
Systems development is difficult and risky because it is often very difficult to determine system requirements, which is further compounded by the fact that requirements tend to change as the system is developed. Usually, the bigger the system and the longer the project, the more the requirements change. Systems development also faces difficulties in terms of scheduling and budgeting. It is often difficult to estimate the time it will take to build a system and if labor hours cannot be estimated, labor costs cannot be estimated. Yet another challenge is that while the project is underway, technology continues to change. Lastly, as development teams become larger, the average contribution per worker decreases. This is true because as staff size increases, more meetings and other coordinating activities are required to keep everyone in sync. There are economies of scale up to a point, but beyond a workgroup of, say, 20 employees, diseconomies of scale begin to take over.

3) Explain how diseconomies of scale can affect systems development.
Unfortunately, as development teams become larger, the average contribution per worker decreases. This is true because as staff size increases, more meetings and other coordinating activities are required to keep everyone in sync. There are economies of scale up to a point, but beyond a workgroup of, say, 20 employees, diseconomies of scale begin to take over.

Brooks' Law points out a related problem: Adding more people to a late project makes the project later. Brooks' Law is true not only because a larger staff requires increased coordination, but also because new people need training. The only people who can train the new employees are the existing team members, who are thus taken off productive tasks. The costs of training new people can overwhelm the benefit of their contribution.

4) What are the phases of the systems development life cycle (SDLC)?
The five phases of the systems development life cycle are (1) system definition, (2) requirements analysis, (3) component design, (4) implementation, and (5) system maintenance.

5) What are the main tasks that are performed during the system definition phase of the SDLC?
During the system definition phase of the SDLC, the development team defines the goal and purpose of the new system. The project's scope is defined by specifying the users or the business processes or the plants, offices, and factories that will be involved. The next step is to assess feasibility. This step answers the question, "Does this project make sense?" The aim here is to eliminate obviously nonsensible projects before forming a project development team and investing significant labor. Feasibility is assessed in terms of four dimensions: cost, schedule, technical, and organizational. If the defined project is determined to be feasible, the next step is to form the project team. Typical personnel on a development team are a manager, system analysts, programmers, software testers, and users. The first major task for the assembled project team is to plan the project. Members of the project team specify tasks to be accomplished, assign personnel, determine task dependencies, and set schedules.

6) Typically, who are part of a systems project team? What are the roles of business analysts and systems

analysts?
Typical personnel on a development team are a manager (or managers for larger projects), business analysts, system analysts, programmers, software testers, and users. Business analysts specialize in understanding business needs, strategies, and goals and helping businesses implement systems to accomplish their competitive strategies. Systems analysts are IT professionals who understand both business and technology.
Systems analysts are closer to IT and are a bit more technical, though there is considerable overlap in the duties and responsibilities of business and system analysts. Both are active throughout the systems development process and play a key role in moving the project through the systems development process. Business analysts work more with managers and executives; systems analysts integrate the work of the programmers, testers, and users. Depending on the nature of the project, the team may also include hardware and communications specialists, database designers and administrators, and other IT specialists.

7) What is meant by technical feasibility and organizational feasibility?
Technical feasibility refers to whether existing information technology is likely to be able to meet the needs of the new system. Organizational feasibility concerns whether the new system fits within the organization's customs, culture, charter, or legal requirements.

8) What is the importance of the requirements analysis phase of the SDLC?
Determining the system's requirements is the most important phase in the systems development process. If the requirements are wrong, the system will be wrong. If the requirements are determined completely and correctly, then design and implementation will be easier and more likely to result in success. Sources of requirements include system users and existing systems. The Web pages, forms, reports, queries, and application features and functions desired in the new system are also determined. Security is another important category of requirements. The easiest and cheapest time to alter the information system is in the requirements phase. Changing a requirement at this stage is simply a matter of changing a description. Changing a requirement in the implementation phase may require weeks of reworking applications components and the database.

9) How is software designed?
Software design depends on the source of the programs. For off-the-shelf software, the team must determine candidate products and evaluate them against the requirements. For off-the-shelf-with-alteration software, the team identifies products to be acquired off-the-shelf and then determines the alterations required. For custom-developed programs, the team produces design documentation for writing program code.

10) What is a test plan?
Once developers have constructed and tested all of the system components, they integrate the individual components and test the system. Software and system testing are difficult, time-consuming, and complex tasks. Developers need to design and develop test plans and record the results of tests. A test plan consists of sequences of actions that users will take when using the new system. Test plans include not only the normal actions that users will take, but also incorrect actions. A comprehensive test plan should cause every line of program code to be executed. The test plan should cause every error message to be displayed.

11) What is beta testing?
Beta testing is the process of allowing future system users to try out the new system on their own. Software vendors, such as Microsoft, often release beta versions of their products for users to try and to test. Such users report problems back to the vendor. Beta testing is the last stage of testing. Normally, products in the beta test phase are complete and fully functioning; they typically have few serious errors.

12) What are the four ways in which organizations can implement a system conversion?
Organizations can implement a system conversion in one of four ways. In a pilot installation, the organization implements the entire system on a limited portion of the business. In a phased installation, the new system is installed in phases across the organization. With parallel installation, the new system runs in parallel with the old one until the new system is tested and fully operational. The final style of conversion is plunge installation (sometimes called direct installation). With it, the organization shuts off the old system and starts the new system.

13) What are the tasks of system maintenance?
The last phase of the SDLC is maintenance. Maintenance is a misnomer; the work done during this phase is either to fix the system so that it works correctly or to adapt it to changes in requirements. First, there needs to be a means for tracking both failures and requests for enhancements to meet new requirements. For small systems, organizations can track failures and enhancements using word-processing documents. Typically, IS personnel prioritize system problems according to their severity. They fix high-priority items as soon as possible, and they fix low-priority items as time and resources become available.

14) What are patches and service packs?
Patches are group fixes for high priority failures that can be applied to all copies of a given product. Software vendors' supply patches to fix security and other critical problems. They usually bundle fixes of low-priority problems into larger groups called service packs. Users apply service packs in much the same way that they apply patches, except that service packs typically involve fixes to hundreds or thousands of problems.

15) What are the problems associated with the SDLC waterfall? Explain with an example.
Although the industry has experienced notable successes with the SDLC process, there have also been many problems with it. One of the reasons for SDLC problems is due to the waterfall nature of the SDLC. Like a series of waterfalls, the process is supposed to operate in a sequence of nonrepetitive phases. For example, the team completes the requirements phase and goes over the waterfall into the design phase, and on through the process. Most commonly, when design work begins and the team evaluates alternatives, they learn that some requirements statements are incomplete or missing. At that point, the team needs to do more requirements work, yet that phase is supposedly finished.

Chapter 11: Information Systems Management

Notes from Multiple Choice Questions

The three principal reasons why employees need to know about the IS department:
- To be a better informed and effective manager or executive
- To be an effective consumer of the IT department's resources
- To ensure that the functions of the IT department are performed

Regarding the IT department's responsibility of planning for information systems (IS) and IT infrastructure, all projects involving IS are a part of a business system or facilitate some business goal.

Microsoft coined the term "agile enterprise".

An organization that can quickly adapt to changes in the market, industry, product, law, or other significant external factors is referred to as an **agile enterprise**.

After planning for information systems and IT infrastructure, the next step is **creating, developing, and adapting both information systems and IT infrastructure**.

Email systems, VPNs, company blogs, and SharePoint sites are IS-based infrastructure.

When there are significant changes in an organization's workload, networks and servers should be **tuned to** these changes.

One of the sources of threats to IT infrastructure is malicious human activity.

CIO is another, more common title given to the vice president of information systems.

Other titles for the **CIO** include director of information services and director of computer services.

The IT department's principal manager is the **CIO**.

In organizations where primary information systems support accounting and finance activities, a reporting arrangement wherein the CIO reports to the **CFO** is practical.

In organizations that operate significant nonaccounting information systems, such as manufacturers, a reporting arrangement wherein the CIO reports to the **CEO** is more common and effective.

An organization that wishes to leverage the power of social networking to help accomplish its goals and objectives should ideally turn to the **technology** group within its IT department for information.

The CTO heads the **technology** group in the IS department.
A **technology office** investigates new information systems technologies and determines how the organization can benefit from them.

In an IS department, the **development group** manages the process of creating new information systems.

An important function for the **operations group** is to monitor user experience and respond to user problems.

The **development** group within the IT department manages the process of creating new information systems as well as maintaining existing information systems.

If a company's IS-related programs are not developed in-house, then the development group within its IT department will be staffed primarily by **systems analysts**.

The development group in a company's IT department is staffed primarily by programmers, test engineers, technical writers, and other development personnel. Based on this information, **the company develops programs in-house.**

In the context of information systems, **maintenance** means either removing problems or adapting existing information systems to support new features and functions.

The **data administration** group protects data and information assets by establishing data standards and data management practices and policies.

Data administration staff establishes data standards and data management practices and policies.

Benefits for which the dollar values can be computed are **tangible benefits**.

Intangible benefits are those for which it is impossible to compute a dollar value.

Responsibilities of a **system analyst:**

- Works with users to determine system requirements
- Designs and develops job descriptions and procedures
- Helps determine system test plans

A **PQA test engineer** develops test plans, designs and writes automated test scripts, and performs testing.

A **network administrator** monitors, maintains, fixes, and tunes computer networks.

A **consultant** performs a wide range of activities such as programming, testing, database design, communications and networks, project management, and so on, and is required to have an entrepreneurial attitude.

Responsibilities of a **small-scale project manager**: initiate, plan, manage, monitor, and close down projects.
As a **user of IS**, you have a right to contribute to requirements for new system features and functions.

Effective training is an IS user's right.

Installation of authorized programs is an IS user's responsibility?

As a user of IS, you have a responsibility to **avoid reporting trivial problems**.

As a user of IS, an employee has a responsibility to avoid **unauthorized hardware modifications**.

Essay Questions

1) Why does one need to know about the IT department?

One needs to know about the IT department for three principal reasons. First, one needs to understand the responsibilities and duties of the IT department in order to be an effective consumer of the IT department's resources. If you understand what the IT department does and how it is organized, you'll know how better to obtain the equipment, services, or systems you need. Second, you need to know about the functions of the IT department to be a better informed and effective manager or executive. Finally, if you are a manager, you need to ensure that the functions of the IT department are performed.

2) Describe the IS department's responsibility to plan for information systems and IT infrastructure.

Information systems exist to further the organization's competitive strategy. They exist to facilitate business processes and to help improve decision making. Thus, there are no "IS projects"; instead, all projects involving IS are a part of some other business system or facilitate some business goal.

The IS department has the responsibility of aligning all of its activities with the organization's primary goals and objectives. As new technology emerges, the IS department is responsible for assessing that technology and determining if it can be used to advance the organization's goals. Furthermore, as the business changes, the IS department is responsible for adapting infrastructure and systems to the new business goals.

3) Who coined the term 'agile enterprise' and what did they mean by it?
Today, many executives use the term 'agile enterprise' to refer to an organization that can quickly adapt to changes in the market, industry, product, law, or other significant external factors. Microsoft used this term many years ago because IT infrastructure and systems are known to be particularly difficult to adapt to change, and it claimed its products would change this characteristic. This might be the case, but the one certain effect of its campaign was to alert IS managers and business executives to the need to be adaptable.

4) Explain the IS department's responsibility to develop and adapt information systems and IT infrastructure.
Given a plan, the next task for the IS department is to create, develop, and adapt both information systems and IT infrastructure. The IS department is responsible for creating and adapting IT infrastructure, such as computer networks, servers, data centers, data warehouses, data marts, and other IS resources. The IS department is also charged with creating systems infrastructures, such as email systems, VPNs, company blogs, SharePoint sites, and other IS-based infrastructure the company needs.

In most organizations, user departments pay for computers and related equipment out of their own budgets. However, because the IS department is responsible for maintaining that equipment and for connecting it to the organizational networks, the IS department will specify standard computer systems and configurations that it will support. The IS department is responsible for defining those specifications.

5) How does the IS department protect infrastructure and data?
The IS department is responsible for protecting infrastructure and data from threats. Threats to IT infrastructure and data arise from three sources: human error and mistakes, malicious human activity, and natural events and disasters.

The IS department helps the organization manage risk. The department needs to identify potential threats, estimate both financial and other risks, and specify appropriate safeguards. Nothing is free, including safeguards, and, indeed, some safeguards are very expensive. The IS department works with the CFO and others in the organization to determine what safeguards to implement, or stated differently, what level of risk to assume.

6) Compare the role of the chief information officer (CIO) and the role of the chief technology officer (CTO).
Chief information officer (CIO) is generally the title of the principal manager of an organization's IT department. Like other senior executives, the CIO reports to the chief executive officer, although sometimes these executives report to the chief operating officer, who in turn reports to the CEO. In some companies, the CIO reports to the chief financial officer. The CIO has the responsibility of managing the IT department, communicating with executive staff on IT- and IS-related matters. The CIO is also a member of the executive group.

The chief technology officer (CTO) often heads the technology group within the IT department. The CTO sorts through new ideas and products to identify those that are most relevant to the organization. The CTO's job requires deep knowledge of information technology and the ability to envision how new IT will affect the organization over time. The CTO's responsibility is to advise the CIO, executive group, and project managers on emerging technologies.

7) What is the typical structure of an organization's IT department?
A typical IT department consists of four groups a technology office that investigates new information systems technologies and determines how an organization can benefit from them; an operations group that manages the computing infrastructure, including individual computers, computer centers, networks, and communications media; a development group that manages the process of creating new information systems as well as maintaining existing information systems; and an outsourcing relations group in organizations that have negotiated outsourcing agreements with other companies to provide equipment, applications, or other services. The data administration staff function protects data and information assets by establishing data standards and data management practices and policies.

However, there are many variations in the structure of the IT department. In larger organizations, the operations group may itself consist of several different departments. Sometimes, there is a separate group for data warehousing and data marts.

8) What is the responsibility of the technology office of a firm's IS department?
Most IS departments include a technology office that investigates new information systems technologies and determines how the organization can benefit from them. For example, today many organizations are investigating cloud computing, virtualization, SOA, social networking, and user-generated content and planning on how they can best use those technologies to accomplish their goals and objectives. An individual called the chief technology officer (CTO) often heads the technology group. The CTO sorts through new ideas and products to identify those that are most relevant to the organization. The CTO's job requires deep knowledge of information technology and the ability to envision how new IS will affect the organization over time.

9) Describe the development group of a firm's IS department.
The development group of an IT department manages the process of creating new information systems as well as maintaining existing information systems. The size and structure of the development group depends on whether programs are developed in-house. If not, this department will be staffed primarily by systems analysts who work with users, operations, and vendors to acquire and install licensed software and to set up the system components around that software. If the organization develops programs in-house, then this department will include programmers, test engineers, technical writers, and other development personnel.

10) What are tangible and intangible benefits?
Most IS and IT investment analyses divide benefits into two categories: tangible and intangible. Tangible benefits are those for which a dollar value can be computed. Reducing customer support costs by 10 percent is a tangible benefit. Intangible benefits are those for which it is impossible to compute a dollar value. The benefits of the email system are intangible.

11) How can one justify IS and IT projects?
One common method for justifying IS and IT projects is to compute the costs and tangible benefits of the system

and to perform a financial analysis. If the project can be justified on tangible benefits alone, then the favorable decision is made. If it cannot be justified on the basis of tangible benefits, then the intangible benefits are considered, and a subjective decision is made as to whether the intangibles are sufficiently valuable to overcome the missing tangible benefits that would be required.

12) Describe the responsibilities of a system analyst, a computer technician, and a network administrator.
A system analyst works with users to determine system requirements, designs and develops job descriptions and procedures, and helps determine system test plans. A computer technician installs software and repairs computer equipment and networks. A network administrator monitors, maintains, fixes, and tunes computer networks.

13) What are a user's rights in relation to the IT department?
In relation to the IT department, users have a right to computer hardware and programs that allow them to perform their jobs proficiently, to reliable network and Internet connections, to a secure computing environment, to protection from viruses, worms, and other threats, and a right to contribute to requirements for new system features and functions. Users also have a right to reliable systems development and maintenance, to prompt attention to problems, concerns, and complaints, to properly prioritized problem fixes and resolutions, and effective training to use systems to perform their jobs.

14) What are a user's responsibilities in relation to the IT department?
In relation to the IT department, users have a responsibility to learn basic computer skills and the standard techniques and procedures for the applications they use, to follow security and backup procedures, to protect their password(s), to use computer resources according to their employer's computer-use policy, to make no unauthorized hardware modifications, to install only authorized programs, to apply software patches and fixes when directed to do so. When asked, they must devote the time required to respond carefully and completely to requests for requirements for new system features and functions. They mustn't resort to reporting trivial problems.

15) Why is the responsibility to install patches important?
The responsibility to install patches is particularly important for patches that concern security and backup and recovery. When asked for input to requirements for new and adapted systems, one has a responsibility to take the time necessary to provide thoughtful and complete responses. If one does not have that time, one should delegate that input to someone else.

Chapter 12: Information Security Management

Notes from Multiple Choice Questions

An employee who intentionally destroys data or other system components is an example of a security threat resulting from **malicious human activity**.

A person calls the Draper residence and pretends to represent a credit card company. He asks Mrs. Draper to confirm her credit card number. This is an example of **pretexting**.

E-mail spoofing is a synonym for phishing.

Drive-by sniffers simply take computers with wireless connections through an area and search for unprotected wireless networks.

An employee carelessly releases proprietary data to the media. This is a case of **unauthorized data disclosure** resulting from **human error**.

A **phisher** pretends to be a legitimate company and sends emails requesting confidential data.

Mark recently received an email from what appeared to be a legitimate company, asking him to update and verify his credit card details. Unknowingly, he obliged and later realized that the information had been misused. Mark is a victim of **phishing**.

Sniffing is a technique for intercepting computer communications.

DOS attacks occur when bogus services flood a Web server.

Some unauthorized programs are able to **usurp** legitimate systems and substitute their own processing.

Hacking occurs when a person gains unauthorized access to a computer system.

A problem in a customer billing system that occurs due to errors made during software installation is a case of **faulty service** resulting from **human error**.

Backup and recovery is an example of a data safeguard against security threats.

Procedure design is a human safeguard against security threats.

Identification and authorization is a technical safeguard against security threats.

A user name **identifies** a user.

A password **authenticates** a user.

Users of smart cards are required to enter a **PIN** to be authenticated.
A **smart** card has a microchip on it that is loaded with identifying data.

Biometric authentication uses personal physical characteristics such as fingerprints, facial features, and retinal scans to verify users.

Encryption is the process of transforming clear text into coded, unintelligible text for secure storage or communication.

Steps of the **Secure Socket Layer** include:
- The computer obtains the public key of the website to which it will connect.
- The computer generates a key for symmetric encryption.
- The computer encodes that key using the Web site's public key.

A **perimeter firewall** sits outside the organizational network and is the first device that Internet traffic encounters.

Packet-filtering firewalls can prohibit outsiders from starting a session with any user behind the firewall.

The program code that causes unwanted activity is called the **payload**.

The broadest definition of **malware** includes viruses, worms, Trojan horses, spyware, and adware.

Trojan horses are malware masquerading as useful programs?

The similarity between adware and spyware is that **both are installed without user's permission**.

Malware definitions are the patterns that exist in malware code and should be downloaded and updated frequently.

Organizations should protect sensitive data by storing it in **encrypted** form.

Because encryption keys can get lost or destroyed, a copy of the key should be stored with a trusted third party. This safety procedure is sometimes called **key escrow**.

Physical security is an example of a data safeguard.

Position sensitivity enables security personnel to prioritize their activities in accordance with the possible risk and loss.

Enforcement of security procedures and policies consists of three interdependent factors: **responsibility, accountability, and compliance**.

In terms of password management, when an account is created, users should **immediately change the password they are given to a password of their own**.
Typically, a help-desk information system has answers to questions that only a true user would know, such as the user's birthplace, mother's maiden name, or last four digits of an important account number. This information **helps authenticate a user**.

Activity log analysis is an important **security monitoring** function.

Hot sites are remote processing centers run by commercial disaster-recovery services.

Every organization should have an **incident-response plan** as part of the security program, which should include how employees are to react to security problems, whom they should contact, the reports they should make, and steps they can take to reduce further loss.

The **incident-response plan** should identify critical personnel and their off-hours contact information.

Essay Questions

1) Distinguish between phishing, spoofing, and sniffing.

Phishing is a technique for obtaining unauthorized data that uses pretexting via email. The phisher pretends to be a legitimate company and sends an email requesting confidential data, such as account numbers, Social Security numbers, account passwords, and so forth.

Spoofing is another term for someone pretending to be someone else. IP spoofing occurs when an intruder uses another site's IP address as if it were that other site. Email spoofing is a synonym for phishing.

Sniffing is a technique for intercepting computer communications. With wired networks, sniffing requires a physical connection to the network. With wireless networks, no such connection is required. Drive-by sniffers simply take computers with wireless connections through an area and search for unprotected wireless networks.

2) Explain denial of service (DOS) in information management.

Human error in following procedures or a lack of procedures can result in denial of service (DOS). For example, humans can inadvertently shut down a Web server or corporate gateway router by starting a computationally intensive application. An OLAP application that uses the operational DBMS can consume so many DBMS resources that order-entry transactions cannot get through. Denial-of-service attacks can be launched maliciously. A malicious hacker can flood a Web server, for example, with millions of bogus service requests that so occupy the server that it cannot service legitimate requests. Computer worms can infiltrate a network with so much artificial traffic that legitimate traffic cannot get through. Finally, natural disasters may cause systems to fail, resulting in denial of service.

3) Discuss in brief the pros and cons of biometric authentication.

Biometric authentication uses personal physical characteristics such as fingerprints, facial features, and retinal scans to authenticate users. Biometric authentication provides strong authentication, but the required equipment is expensive. Often, too, users resist biometric identification because they feel it is invasive. Biometric authentication is in the early stages of adoption. Because of its strength, it likely will see increased usage in the future. It is also likely that legislators will pass laws governing the use, storage, and protection requirements for biometric data.

4) Differentiate between symmetric and asymmetric encryption.

To encode a message, a computer program uses the encryption method with the key to convert a noncoded message into a coded message. The resulting coded message looks like gibberish. Decoding (decrypting) a message is similar; a key is applied to the coded message to recover the original text. With symmetric encryption, the same key (again, a number) is used to encode and to decode. With asymmetric encryption, two keys are used; one key encodes the message, and the other key decodes the message. Symmetric encryption is simpler and much faster than asymmetric encryption. A special version of asymmetric encryption, public key/private key, is used on the Internet.

5) What are firewalls? What types of firewalls are commonly used?

A firewall is a computing device that prevents unauthorized network access. A firewall can be a special-purpose computer or it can be a program on a general-purpose computer or on a router. Organizations normally use multiple firewalls. A perimeter firewall sits outside the organizational network; it is the first device that Internet traffic encounters. In addition to perimeter firewalls, some organizations employ internal firewalls inside the organizational network. A packet-filtering firewall examines each part of a message and determines whether to let that part pass. To make this decision, it examines the source address, the destination address(es), and other data. Packet-filtering firewalls can prohibit outsiders from starting a session with any user behind the firewall.

6) How is a Trojan horse different from a worm?

There are many different types of viruses. Trojan horses are viruses that masquerade as useful programs or files. A typical Trojan horse appears to be a computer game, an MP3 music file, or some other useful, innocuous program. A worm is a virus that propagates using the Internet or other computer network. Worms spread faster than other virus types because they are specifically programmed to spread. Unlike nonworm viruses, which must wait for the user to share a file with a second computer, worms actively use the network to spread. Sometimes, worms so choke a network that it becomes unusable.

7) What is the difference between adware and spyware?

Spyware programs are installed on the user's computer without the user's knowledge or permission. Spyware resides in the background and, unknown to the user, observes the user's actions and keystrokes, monitors computer activity, and reports the user's activities to sponsoring organizations. Some malicious spyware captures keystrokes to obtain user names, passwords, account numbers, and other sensitive information. Other spyware supports marketing analyses, observing what users do, Web sites visited, products examined and purchased, and so forth. Adware is similar to spyware in that it is installed without the user's permission and it also resides in the background and observes user behavior. Most adware is benign in that it does not perform malicious acts or steal data. It does, however, watch user activity and produce pop-up ads. Adware can also change the user's default window or modify search results and switch the user's search engine.

8) List some important malware safeguards.

It is possible to avoid most malware using the following malware safeguards: (1) install antivirus and antispyware programs on your computer, (2) set up the anti-malware programs to scan your computer frequently, (3) update malware definitions, (4) open email attachments only from known sources, (5) promptly install software updates from legitimate sources, and (6) browse only in reputable Internet neighborhoods.

9) How can data safeguards protect against security threats?

Data safeguards protect databases and other organizational data. Both data and database administration are involved in establishing the data safeguards. First, data administration should define data policies. Then, data administration and database administration(s) work together to specify user data rights and responsibilities. Third, those rights should be enforced by user accounts that are authenticated at least by passwords. The organization should protect sensitive data by storing it in encrypted form. It is important to periodically create backup copies of database contents. Physical security is another data safeguard.

10) Explain how defining positions in an organization can safeguard against security threats.

Effective human safeguards begin with definitions of job tasks and responsibilities. In general, job descriptions should provide a separation of duties and authorities. For example, no single individual should be allowed both to approve expenses and write checks. Instead, one person should approve expenses, another pay them, and a third should account for the payment. Similarly, in inventory, no single person should be allowed to authorize an inventory withdrawal and also to remove the items from inventory. Given appropriate job descriptions, user accounts should be defined to give users the least possible privilege needed to perform their jobs. For example, users whose job description does not include modifying data should be given accounts with read-only privilege. Similarly, user accounts should prohibit users from accessing data their job description does not require. Because of the problem of semantic security, even access to seemingly innocuous data may need to be limited. Finally, the security sensitivity should be documented for each position. Some jobs involve highly sensitive data (e.g., employee compensation, salesperson quotas, and proprietary marketing or technical data). Other positions

involve no sensitive data. Documenting position sensitivity enables security personnel to prioritize their activities in accordance with the possible risk and loss.

11) What are the three interdependent factors involved in the enforcement of security policies and procedures?

Enforcement consists of three interdependent factors: responsibility, accountability, and compliance. First, the company should clearly define the security responsibilities of each position. The design of the security program should be such that employees can be held accountable for security violations. Procedures should exist so that when critical data are lost, it is possible to determine how the loss occurred and who is accountable. Finally, the security program should encourage security compliance. Employee activities should regularly be monitored for compliance, and management should specify disciplinary action to be taken in light of noncompliance.

12) Explain account management.

Account management concerns the creation of new user accounts, the modification of existing account permissions, and the removal of unneeded accounts. Information system administrators perform all of these tasks, but account users have the responsibility to notify the administrators of the need for these actions. The IT department should create standard procedures for this purpose. The existence of accounts that are no longer necessary is a serious security threat. Information system administrators cannot know when an account should be removed; it is up to users and managers to give such notification.

13) What is the difference between a hot site and a cold site?

Both hot sites and cold sites are backup processing centers. Hot sites are remote processing centers run by commercial disaster-recovery services. For a monthly fee, they provide all the equipment needed to continue operations following a disaster. Cold sites, in contrast, provide office space, but customers themselves provide and install the equipment needed to continue operations.

14) Describe an incident-response plan.

Every organization should have an incident-response plan as part of the security program. The plan should include how employees are to respond to security problems, whom they should contact, the reports they should make, and steps they can take to reduce further loss.

The plan should provide centralized reporting of all security incidents that will enable an organization to determine if it is under systematic attack or whether an incident is isolated. Centralized reporting also allows the organization to learn about security threats, take consistent actions in response, and apply specialized expertise to all security problems. Viruses and worms can spread very quickly across an organization's networks, and a fast response will help to mitigate the consequences. Because of the need for speed, preparation pays. The incident-response plan should identify critical personnel and their off-hours contact information. These personnel should be trained on where to go and what to do when they get there. Finally, organizations should periodically practice incident response.

15) What should an organization do when a security breach occurs in its information systems?

When an incident does occur, speed is of the essence. Viruses and worms can spread very quickly across an organization's networks, and a fast response will help to mitigate the consequences. Because of the need for speed, preparation pays. The incident-response plan should identify critical personnel and their off-hours contact information. These personnel should be trained on where to go and what to do when they get there. Without adequate preparation, there is substantial risk that the actions of well-meaning people will make the problem

worse. Organizations should periodically practice incident response. Without such practice, personnel will be poorly informed on the response plan, and the plan itself may have flaws that only become apparent during a drill.