**Chapter 7** Computer and Network Security

1. Describe three “low-tech” methods that hackers have used to obtain login names and passwords.

*Ans*.: Three “low-tech” methods that hackers have used to obtain login names and passwords are eavesdropping, dumpster diving, and social engineering. Eavesdropping, such as simply looking over the shoulder of a legitimate computer user to learn his login name and password, is a common way that hackers gain access to computers. Dumpster diving means looking through garbage for interesting bits of information. Social engineering refers to the manipulation of a person inside the organization to gain access to confidential information.

1. Define the following terms: (a) virus, (b) worm, (c) spyware, (d) adware, (e) rootkit, (f) Trojan horse, (g) backdoor Trojan, (h) bot, (i) botnet.

*Ans*.: (a) A virus is a piece of self-replicating code contained inside another program, called the host.

(b) A worm is a self-contained program that is capable of automatically propagating through a computer network by exploiting security holes.

(c) Spyware is a program that communicates over a computer’s Internet connection without the knowledge or consent of the user.

(d) Adware is a type of spyware that displays pop-up advertisements.

(e) A rootkit is a set of programs that are launched every time the victim's computer is booted. The programs have privileged access to the computer’s functions, and because they start executing before the operating system has launched, they use their privileges to hide their presence.

(f) A Trojan horse is a program that publicly does something beneficial but privately performs other harmful actions.

(g) A backdoor Trojan is a Trojan horse program that gives an outsider access to the victim’s computer.

(h) A bot is a type of backdoor Trojan that can be controlled by a command-and-control program on another computer.

(i) A botnet is a network of bot-infected computers controlled by a single person or organization.

1. Define the following terms: (a) denial-of-service attack, (b) distributed denial-of-service attack, (c) phishing, (d) spear-phishing, (e) SQL injection.

*Ans*.: (a) A denial-of-service attack is an intentional action designed to prevent legitimate users from gaining access to a networked computer service.

(b) A distributed denial-of-service attack is a type of denial-of-service attack in which multiple computers attack the computer service. Botnets can be used to launch distributed denial-of-service attacks.

(c) Phishing is an effort to gain sensitive information from gullible computer users through the use of a mass emailing.

(d) Spear-phishing is a type of phishing in which the email list is narrowed down to improve the success rate.

(e) SQL injection is a way to attack a database-driven web application by injecting an SQL query into a text string.

1. What is a cyber attack?

*Ans*.: A cyber attack is an attack from one computer to another that attempts to disable the target computer or steal information from it.

1. What did the Stuxnet worm do?

*Ans*.: The Stuxnet worm infected computers in Iran that controlled centrifuges processing uranium, causing a temporary shutdown of Iran's nuclear program.

1. The process of determining that a user has permission to perform a particular action on a computer is called

(a) accountability (b) authentication (c) authorization (d) social engineering

1. Determining that a person is who he or she claims to be on a computer is called

(a) accountability (b) authentication (c) authorization (d) social engineering

**Chapter 8** Computer Reliability

1. What is an embedded system? What is a real-time system?

*Ans*.: An embedded system is a computer used as a component of a larger system. A real-time system is a computer that processes data from sensors as events occur.

1. What does a linear accelerator do?

*Ans*.: A linear accelerator is a device that is used to treat cancer patients with radiation.

1. What was the most important difference between the Therac-20 and its successor, the Therac-25?

*Ans*.: In the Therac-20 the PDP 11 minicomputer was an optional add-on. Hardware interlocks to prevent accidental overdoses remained in place. In contrast, the PDP 11 front end computer was fully integrated into the Therac-25. Some hardware interlocks on the Therac-20 were replaced with software controls on the Therac-25.

1. How long was the Therac-25 in operation before the first documented accident? How much longer did it take for the system to be declared unsafe?

*Ans*.: The Therac-25 was in operation two years before the first documented accident. It took another 20 months for the Therac-25 to be declared defective by the FDA.

1. What is a race condition in software? Why are race conditions difficult to debug?

*Ans*.: A race condition in software is a situation in which two or more concurrent tasks share a variable, and the order in which they read or write the value of the variable can affect the behavior of a program. Race conditions are difficult to debug, because in order for a failure to occur, the timing of events must be exactly right.

1. What are the advantages of allowing software users to identify and report bugs? What are the disadvantages?

*Ans*.: (1) The advantage of allowing software users to identify and report bugs is that there are usually many more users outside the company than software testers inside the company. When many more people are exercising the software, there is a greater chance that errors can be discovered.

(2) One disadvantage of allowing software users to identify bugs is that if a lot of bugs are discovered, the reputation of a company can suffer. Also, most software users are not trying to break the software, so even if a lot of people are using a program, that is no guarantee that every bug will be found in a reasonable amount of time.

1. What is the difference between a model and a computer simulation?

*Ans*.: A model is a representation of an actual system. There are different kinds of models, including physical models and mathematical models. A computer simulation is a program that implements a mathematical model.

1. What is the difference between verification and validation?

*Ans*.: Verification is the process of determining if the computer program correctly implements the model. Validation is the process of determining if the model is an accurate representation of the real system.

1. What is the significance of the court’s ruling in *Step-Saver Data Systems v. Wyse Technology and The Software Link*?

*Ans*.: The significance of the court’s ruling in *Step-Saver Data Systems v. Wyse Technology and The Software Link* is that the purchase order, the invoice, and the oral statements constituted the contract, not the software license agreement.

1. What is the significance of the court’s ruling in *ProCD, Inc. v. Zeidenberg*?

*Ans*.: The significance of the court’s ruling in *ProCD, Inc. v. Zeidenberg* is that shrinkwrap licenses are enforceable unless their terms are unconscionable, even though the licenses are not visible before the box is opened.

1. Refer to the following scenario. Was Amazon.com wrong to refuse to fill the orders of the people who bought iPAQs for £7? Answer this question by using Rule Utilitarianism.

Amazon.com shut down its British web site on March 13, 2003, after a software error led it to offer iPAQ handheld computers for £7 instead of £275. Before Amazon.com shut down the site, a lot of customers placed orders, some of them ordering as many as 10 iPAQs. Amazon said that customers who ordered at the mistaken price should not expect delivery unless they paid the true price.

An Amazon.com spokesperson said, “In our Pricing and Availability Policy, we state that where an item’s correct price is higher than our stated price, we contact the customer before dispatching. Customers will be offered the opportunity either to cancel their order or to place new orders for the item at the correct price”.

Did those customers who ordered the iPAQs for £7 do anything wrong? Answer this question by using Kantianism.

*Ans*.: Refer to slide 17 for the Rule Utilitarian analysis.

Refer to slide 18 for the Kantian analysis.

**Chapter 9** Professional Ethics

1. What is a profession? How is a computer-related career, such as programming or system administration, similar to a mature profession, such as medicine? How is a computer-related career unlike a mature profession?

*Ans*.: A profession is a vocation requiring a high level of education and practical experience in the field. Software engineering has little in common with a mature profession such as medicine or law, other than the ability to cause great harm. Initial professional education is very helpful, but not required. Even if software engineers get an undergraduate degree in computer science, the program may not be accredited. There is no mandatory licensing of software engineers. Professional societies exist, but software engineers do not have to belong to one of them. A code of ethics exists, but following the code is strictly voluntary.

1. The “Software Engineering Code of Ethics and Professional Practice” was developed by the two largest organizations supporting the computing field. Names these two organizations (short forms not allowed).

*Ans*.: These two organizations are the “IEEE Computer Society” and the “Association for Computing Machinery”.

1. What is virtue ethics?

*Ans*.: Virtue ethics is the ethical theory that holds the right thing to in a particular circumstance is what a person of high moral character would do in that situation. A person obtains high moral character by possessing many virtues. A person possesses a virtue by repeatedly practicing that virtue.

1. What is whistleblowing? What harms does it cause? What benefits may it provide?

*Ans*.: Whistleblowing occurs when an organization is involved in an activity that is fraudulent or a threat to public safety, and a member of that organization reveals information about this activity to someone outside the organization.

Harms of whistleblowing: Whistleblowing usually ruins the career of the whistleblower and causes turmoil within the organization. The public relations damage caused the organization may harm it for years to come.

Possible benefits of whistleblowing: Whistleblowing may keep people from being hurt, or it may prevent the public from being defrauded. Whistleblowing may discourage other companies from engaging in activities that defraud or harm the public.

**Chapter 10** Work and Wealth

1. What are some benefits brought about by automation? What are some harms brought about by automation?

*Ans*.: Automation reduces the price of goods, increasing the real income of the people who buy those goods. With a higher real income, people can use the extra money to buy other things. Hence automation increases the standard of living. However, automation puts some people out of work. They must go through unemployment, and perhaps retraining, before getting another job. People who are too old may be unable to find another job after being displaced by a machine.

1. What evidence has been given to show that automation eliminates jobs? What evidence has been given to show that automation creates more jobs than it destroys?

*Ans*.: (1) There is evidence that automation eliminates jobs. Spreadsheets and other software packages are reducing the need for accountants and bookkeepers. In the United States, a large number of white-collar, middle-management jobs were eliminated in 1991-1996.

(2) There is also evidence that automation creates more jobs than it destroys. Automation causes new kinds of jobs to be created. For example, the automation of stock exchanges has led securities firms to hire mathematicians and computer scientists to develop automated trading systems.

1. How can information technology lead to changes in the structure of an organization?

*Ans*.: Information technology can lead to changes in the structure of an organization by opening up new communication paths. Access to information can lead to a decentralization of decision-making.

1. How does Pippa Norris categorize the digital divide?

*Ans*.: Norris says the digital divide has two dimensions. The *global divide* refers to the disparity in Internet access between more industrialized nations and less industrialized nations. The *social divide* refers to the difference in access between the rich and poor within a particular country.

1. Why does Warschauer say the notion of the digital divide is too simplistic and perhaps harmful?

*Ans*.: Warschauer says the term “digital divide” promotes the idea that the difference between the “haves” and the “have nots” is simply a question of access, but it’s more complicated than that. In reality, the underlying social system affects the adoption of information technology. Another problem with the term “digital divide” is that it implies that people either use information technology or they do not, when in reality there is a continuum of engagement with information technology. Third, the term “digital divide” implies that a lack of access will lead to a less advantaged position in society. But there is no simple causality. Each factor affects the other.