



October, 2007

Network Engineer Examination (Morning)

Questions must be answered in accordance with the following:

Question Nos.	Q1 – Q55
Question Selection	All questions are compulsory
Examination Time	9:30 – 11:10 (100 minutes)

Instructions:

1. Use a pencil. If you need to change an answer, erase your previous answer completely and neatly. Wipe away any eraser debris.
2. Mark your examinee information and test answers in accordance with the instructions below. Your test will not be graded if you do not mark properly. Do not mark or write on the answer sheet outside of the prescribed places.

(1) **Examinee Number**

Write your examinee number in the space provided, and mark the appropriate space below each digit.

(2) **Date of Birth**

Write your date of birth (in numbers) exactly as it is printed on your examination admission card, and mark the appropriate space below each digit.

(3) **Answers**

Select one answer (a through d) for each question.

Mark your answers as shown in the following sample question.

[Sample Question]

In which month is the Network Engineer Examination conducted?

Answer group

- a) September b) October c) November d) December

Since the correct answer is “b)” (October), mark your answer sheet as follows:

[Sample Reply]

No.	a	b	c	d
Q 1	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>

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Do not open the exam booklet until instructed to do so.
Inquiries about the exam questions will not be answered.

Q1. Which of the following is used to provide a two-bit error detection function and a one-bit error correction function as a memory-error control method?




- a) Checksum
- b) Hamming code
- c) Horizontal parity
- d) Odd parity

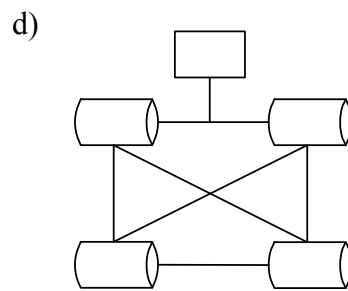
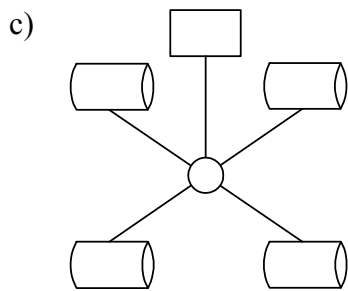
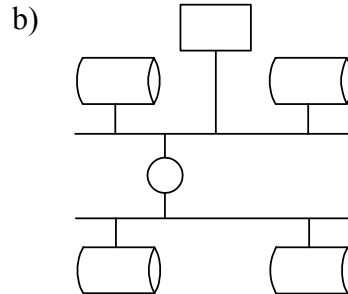
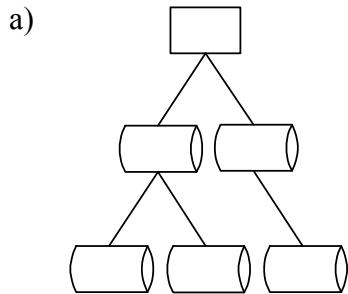
Q2. When there is insufficient real memory capacity in a virtual memory system, which of the following terms represents the case where an increase in the multiplicity of programs causes an increase in the system overhead resulting in a decrease in CPU usage for processing applications?

- a) Bottleneck
- b) Fragmentation
- c) Paging
- d) Thrashing

Q3. In task scheduling using the preemption method, which of the following is a trigger when preemption occurs during the execution of task B? Here, the priorities of the tasks are as follows: task A has the highest priority, and task A > task B = task C > task D.

- a) Task A has just become “ready.”
- b) Task B has just become “waiting.”
- c) Task C has just become “ready.”
- d) Task D has just become “ready.”

Q4. Which of the following is an appropriate SAN connection method? Here,  is used as a server,  as a storage device, and  as a fiber channel switch.



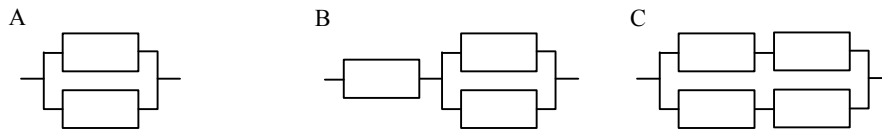
Q5. The relation among the average line waiting time, the average transmission time, and the average line usage rate follows the M/M/1 queuing model. We would like the average line waiting time to be less than or equal to a triple of the average transmission time. What percentage should the average line usage rate be at maximum?

- a) 50 b) 66 c) 75 d) 80

Q6. There is a program that retrieves records from a magnetic disk using random access. The greater part of the access time consists of positioning time, rotational delay time, and transfer time. In addition, multiple records in the same block cannot be retrieved at the same time using random access. Which of the following is a correct statement concerning the relationship between block length and retrieval time? Here, assume that neither positioning time nor rotational delay time depends on block length.

- a) Even if block length were increased, there would be no change in retrieval time since the transfer time per record would remain constant.
- b) If block length is increased, then block transfer time will increase. This will result in an increase in retrieval time equal to the increase in the transfer time.
- c) The length of a block does not have any effect on retrieval time.
- c) To shorten retrieval time, it is more effective to introduce buffering and disk caches than to adjust the block length.

Q7. When combining devices of the same availability in series or parallel, which of the following lists the circuits in the order of the availability of the entire system, from the highest? Here, the availability of each device is greater than 0 and less than 1, and “X > Y” indicates that the X has a higher availability than Y.



- a) $A > B > C$
- b) $A > C > B$
- c) $C > A > B$
- d) $C > B > A$

Q8. Which of the following correctly describes “failsafe”?

- a) The system is designed in such a way that malfunctions do not tend to occur even if an unspecified number of people operate the system.
- b) Those elements in the system that greatly affect reliability are present in multiple quantities, thereby enhancing reliability.
- c) When an abnormality occurs in a system, the system is not immediately stopped, but operation continues with degenerated functions.
- d) Whenever any failure occurs in a system, the system is controlled in the safest possible way.

Q9. Which of the following is a collection of data that is designed for the purpose of supporting a DSS (Decision Support System) function and in which data is organized and stored by subject?

- a) Data dictionary
- b) Data warehouse
- c) Hash table
- d) Metadata

Q10. A repository system, which is used to develop software, is a kind of DBMS for managing metadata. Which of the following is a function that is not needed in a general DBMS but that is essential to a repository system?

- a) A concurrency control function for the purpose of ensuring consistency among data that has been input from many terminals
- b) A function that controls the permission to update or refer to each item of data
- c) A function that manages multiple versions of stored data
- d) An inquiry function for stored data

Q11. Which of the following is a task supported by software configuration management tools?

- a) Cost Management
- b) Process Management
- c) Quality Management
- d) Version Management

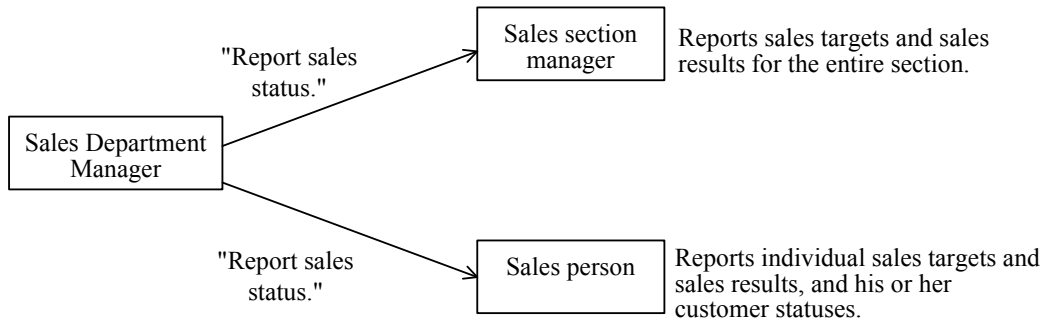
Q12. Which of the following is the purpose of CMMI?

- a) It improves processes by using a process maturity model for the organization developing the software.
- b) It improves the customer satisfaction through quality assurance of software products delivered between certain designated developers and purchasers.
- c) It standardizes software processes by classifying software life cycles into three life cycle processes including main, support, and organizational processes and by defining activities.
- d) It uses various software design and development methods to automate the development work and to improve the productivity of software development.

Q13. Among diagrams used in UML, which of the following can express interaction done through messages sent and received between objects?

- a) Component diagram
- b) Sequence diagram
- c) State chart diagram
- d) Use case diagram

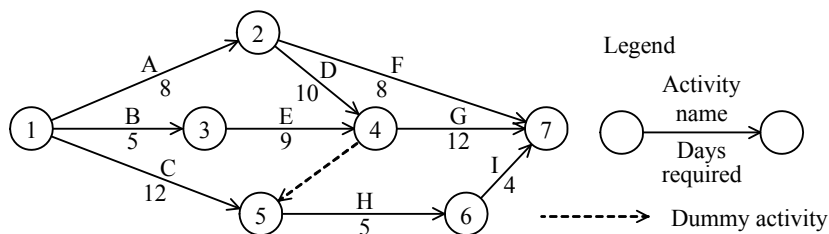
Q14. In the figure below, the sales section manager and sales person perform different services in response to the same message, "Report sales status." Which of the following is the object orientated term that describes such a characteristic?



- The sales department manager sends the message "Report sales status," to a sales section manager and a sales person.
- The sales section manager sends back the sales targets and sales results for his/her entire section as response.
- The salesperson sends back his/her own sales targets, sales results, and his/her customer statuses as response.

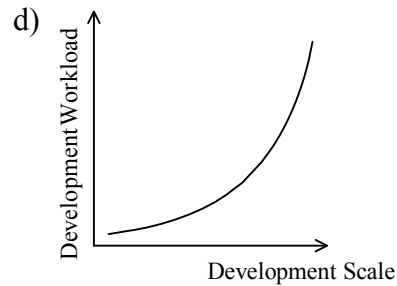
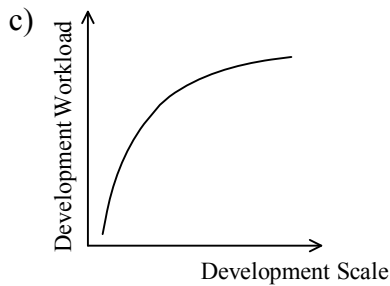
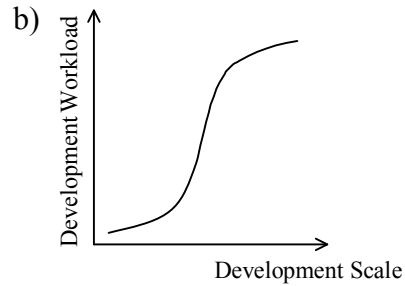
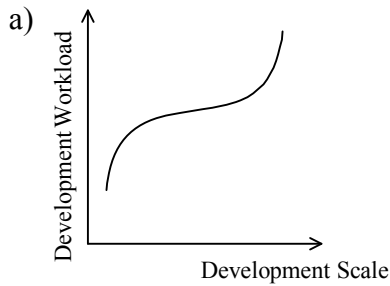
- a) Abstraction
- b) Capsulation
- c) Inheritance
- d) Polymorphism

Q15. If the tasks of a certain project are planned according to the figure shown below, in order to complete the project in the minimum number of days, how many days after the beginning of the project must the join point ⑤ be passed at the latest?

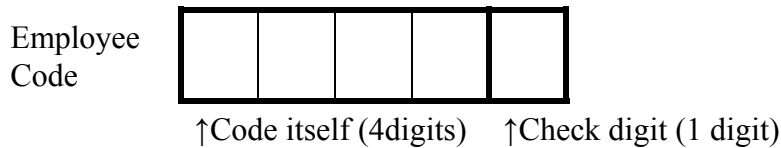


- a) 12
- b) 14
- c) 18
- d) 21

Q16. Which of the following graphs correctly represents the relationship between software development scale and development workload?



Q17. In a certain system, the check digit to be added to an "employee code" is obtained by the calculation shown below. Which of the following employee codes is considered to be an error when checked using this check digit?



[Calculation of the Check Digit]

- (1) Multiply each digit by 4, 3, 2, and 1, respectively, from the highest digit.
- (2) Add the results of (1).
- (3) Divide the sum by 10, and the remainder is the check digit.

- a) 13127 b) 21121 c) 37183 d) 49150

Q18. We are developing two groupware applications using servers connected by WAN: one is a product catalog system, in which a large volume of data including graphic information needs to be updated on a regular basis, and the other is a conference room reservation system requiring real-time updating. This groupware has a replicating function that synchronizes the contents of databases on multiple servers automatically. At a designated time, information to be updated can be reflected from the source database to the target database. Which of the following is an appropriate database arrangement taking into account the amount of data and the operation of the applications?

- a) Place the product catalog system on a single server and the conference room reservation system on another single server.
- b) Place the product catalog system on a single server and the conference room reservation system on multiple servers using replication.
- c) Place the product catalog system on multiple servers using replication and the conference room reservation system also on multiple servers using replication.
- d) Place the product catalog system on multiple servers using replication and the conference room reservation system on a single server.

Q19. Which of the following is an appropriate explanation of SLA?

- a) A framework in which the system operational procedures are systematized
- b) A software life cycle process from development through maintenance
- c) An agreement between the user and the provider on service quality
- d) An international standard concerning the quality management system of a product vendor

Q20. Which of the following is a reason for constructing repositories in the development and maintenance processes of software?

- a) It allows each process to be managed in such a way that the task plan and actual results are linked together and to be made easier to manage the task progress.
- b) It makes defining task procedures easier in each process, thus helping to prevent task errors during development and maintenance.
- c) It makes the management of defects at each process possible and thus makes it easier to analyze the quality of the software.
- d) It unifies the terminologies by managing the deliverables of each process in an integrated manner and thus improves the efficiency of development and maintenance tasks.

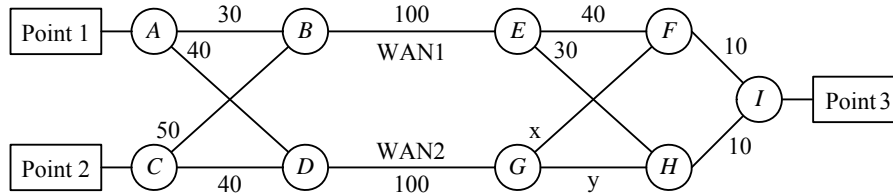
Q21. Which of the following is an appropriate statement concerning the flow control of TCP?

- a) It controls windows on a bit-by-bit basis.
- b) It is a function of the network layer of the OSI basic reference model.
- c) It recovers data by the re-transmission process when there is no acknowledgement.
- d) The data is processed in the order in which it is received because the data has no order numbers.

Q22. Which of the following is included in the IP header in IPv4?

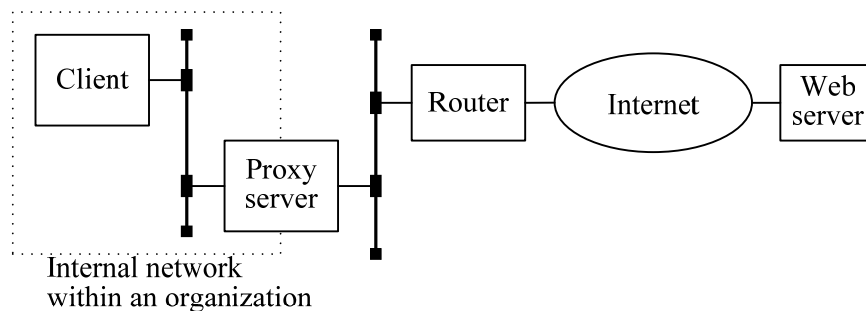
- a) Destination MAC address
- b) Destination port number
- c) Sequence number
- d) Time to live (TTL)

Q23. The figure shows the network configuration of routers *A* through *I* using OSPF. We want the communication between points 1 and 3 to go through WAN1 and the communication between points 2 and 3 through WAN2. Which of the following is an appropriate combination of the costs to be specified at *x* and *y*? Here, the numbers in the figure indicate the OSPF costs.



	x	y
a)	20	20
b)	30	30
c)	40	40
d)	50	50

Q24. The figure shows the route used when a client on the TCP/IP network within an organization accesses a Web server outside the organization via a proxy server, a router, and the Internet. Where are the TCP connections for this communication established?



- a) Between the client and the proxy server and between the proxy server and the Web server.
- b) Between the client and the proxy server, between the proxy server and the router, and between the router and the Web server.
- c) Between the client and the router and between the router and the Web server.
- d) Between the client and the Web server and between the client and the proxy server.

Q25. Which of the following is the subnet mask for partitioning a class C network into four subnets, each of which can include 50 nodes?

- a) 255.255.255.0
- b) 255.255.255.64
- c) 255.255.255.128
- d) 255.255.255.192

Q26. A site which uses the four subnets 10.8.64.0/20, 10.8.80.0/20, 10.8.96.0/20, and 10.8.112.0/20 are to be connected to another site. Out of the aggregated network addresses that can be used for path control, which of the following has the narrowest range of aggregation?

- a) 10.8.0.0/16
- b) 10.8.0.0/17
- c) 10.8.64.0/18
- d) 10.8.64.0/19

Q27. Which of the following IP addresses can be used for multicast?

- a) 10.0.127.255
- b) 127.0.1.255
- c) 192.168.255.255
- d) 224.0.1.84

Q28. Which of the following is the protocol used by the command "ping" for checking the connection status of network devices?

- a) DHCP
- b) ICMP
- c) SMTP
- d) SNMP

Q29. Which of the following correctly describes CHAP?

- a) It is a connection-oriented protocol that passes PPP packets through an IP network.
- b) It is a protocol that repeats user authentication by transmitting a challenge message on a constant cycle after a PPP link is established.
- c) It is an authentication protocol developed for IPv6.
- d) It is an authentication protocol that checks user IDs and passwords after a PPP link is established.

Q30. Which of the following correctly describes RSVP?

- a) This protocol controls traffic flowing through the Internet by adding priority information to IP packets in order to realize QoS.
- b) This protocol guarantees time differences between packets carrying real-time information by adding sequence numbers and time stamps.
- c) This protocol makes reservations for network resources, and realizes real-time communication of multimedia information between nodes.
- d) This protocol remotely controls sources of continuous information such as audio-visual information.

Q31. Which of the following is an appropriate explanation of SIP?

- a) It describes media types such as audio and images as well as the port number used by the protocol for data communication and other information.
- b) It describes the payload type, sequence number, and time stamp when audio information is sent to an IP network as real time streaming.
- c) It establishes, changes, and shuts off multimedia communication sessions of audio and images between user agents.
- d) It is used to exchange statistical values such as the number of missing packets and the variance of packet arrival intervals between terminals.

Q32. The method of correcting an error by using a hamming code whose length is 7 bits and which contains four information bits is as follows:

For a received 7-bit coded word, $x_1, x_2, x_3, x_4, x_5, x_6,$ and x_7 ($x_k = 0$ or 1), the following calculations are performed:

$$c_0 = x_1 + x_3 + x_5 + x_7$$

$$c_1 = x_2 + x_3 + x_6 + x_7$$

$$c_2 = x_4 + x_5 + x_6 + x_7$$

(Each calculation is performed in mod 2.)

If at least one of the variables $c_0, c_1,$ and c_2 is not 0, then the following calculation is performed to obtain the value of i . An error is corrected by inverting the i^{th} bit from the left.

$$i = c_0 + c_1 \times 2 + c_2 \times 4$$

If the received coded word is 1000101, which of the following is the coded word after the correction?

- a) 1000001 b) 1000101 c) 1001101 d) 1010101

Q33. MPEG standards are of several types depending on resolutions and compression ratios. Which of the following correctly describes MPEG-1?

- a) This standard pertains to a compression method for bit rates of several M to several dozen M bits per second. It is a general-purpose method that can be commonly used for storage-type media, broadcasting, and communication.
- b) This standard, which pertains to a compression method for bit rates of approximately 1.5 M bits per second, applies primarily to storage-type media such as CD-ROMs.
- c) This standard, which pertains to a compression method for bit rates of more than 60 M bits per second, applies primarily to high-quality television broadcasting.
- d) This standard, which pertains to one of the compression methods for bit rates as low as several dozen to several hundred bits per second, applies primarily to equipment such as mobile electronic devices.

Q34. When a sound signal with a bandwidth of 4 kHz is digitally encoded in 8-bit form and transmitted, what is the minimum transmission speed, in Kbits per second, according to the sampling theorem?

- a) 8 b) 16 c) 32 d) 64

Q35. Which of the following is a correct statement concerning text data transmission and binary data transmission? Here, text data consists only of graphic characters.

- a) By converting subject data to text data character strings, it is possible to send binary data using procedures normally used to transmit text data.
- b) In binary data transmission, it is impossible to use transmission control procedures other than HDLC procedures.
- c) In text data transmission, a 1-bit parity is appended to 7-bit character data and then transmitted. In binary data transmission, subject data is divided into 8-bit pieces and transmitted as is.
- d) In text data transmission, non-procedures are used. In binary data transmission, basic control procedures are used.

Q36. Four nodes, A, B, C, and D, are connected by a 10 Mbps LAN. If file transfers between A and B and between C and D are performed under the following conditions, what is the approximate operating ratio of the LAN as expressed in a percentage? Here, control information equivalent to 30 percent of file size is added upon transmission. Furthermore, repeater hubs are used in the LAN, and collisions are not considered.

File size per transfer: 1,000 bytes on average

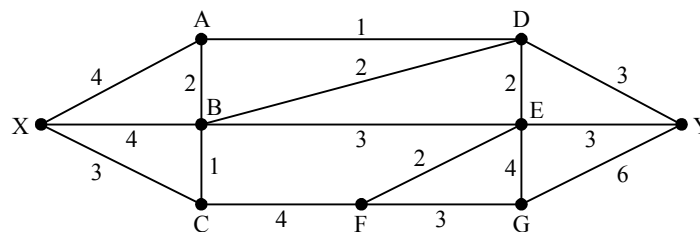
File transfer frequency: 60 times per second per file on average

- a) 2 b) 6 c) 10 d) 12

Q37. The traffic to and from 180 telephones was analyzed. It was found that the frequency of calls per telephone (sum of originating and incoming calls) was once every three minutes, and the average line hold time was 80 seconds. What is the traffic intensity in erlangs in this case?

- a) 4 b) 12 c) 45 d) 80

Q38. In the network shown in the figure below, each number denotes the multiplicity of the logical circuits that can be used simultaneously between two points. What is the maximum number of logical circuits that can be used simultaneously between point X and point Y?



- a) 8 b) 9 c) 10 d) 11

Q39. Which of the following is an appropriate explanation of a LAN cable?

- a) A category 5E UTP cable is a non-shielded twisted pair cable used in 1000BASE-T, containing 4 pairs of two wires each.
- b) A paired wire transmits information by the electric potential difference between the two wires, and the level of external noise on the paired wire is inversely proportional to the distance between the wires.
- c) In 1000BASE-TX using category 6 UTP cables, each twisted pair wires is used to send data at 250 Mbits per second upstream and downstream simultaneously; a total of 4 pairs achieves full duplex communication at 1 Gbits per second.
- d) The wires that are paired up in a LAN cable are twisted to reduce external noise generated on the wires; this is more effective if the pitch of all the paired wires in the cable is uniform.

Q40. Which of the following is a technology used to build a VPN over the Internet and contains protocols such as ESP (Encapsulating Security Payload) and AH (Authentication Header)?

- a) IPsec b) MPLS c) PPP d) SSL

Q41. Which of the following is carrier sense multiple access with collision avoidance used in wireless LANs?

- a) CDMA b) CSMA/CA c) CSMA/CD d) FDMA

Q42. Which of the following is the protocol used for routing between AS (autonomous systems) on the Internet?

- a) BGP b) ISIS c) OSPF d) RIP

Q43. Which of the following is a method applied to a wireless LAN in which a 40-bit or 104-bit value is set in advance as an encryption key for encrypting a communication frame?

- a) EAP b) ESS-ID c) WEP d) WPA

Q44. Which of the following correctly applies to a spanning tree?

- a) A decision is made as to whether to discard or relay a frame by checking the MAC address.
- b) Any MAC address for which there has been no communication for a certain period of time is deleted from the MAC address table.
- c) If multiple paths exist, they are allocated by application or by address, thereby distributing the load.
- d) Information is exchanged among multiple bridges, thereby detecting the occurrence of loops and deciding alternative routes to take when failures occur.

Q45. Which of the following is an appropriate description concerning SNMP that is a network management protocol for TCP/IP?

- a) A message defined in SNMP is allowed, in which an agent responds to a request from the manager.
- b) All messages from agents are sent to the same port of the manager.
- c) SNMP uses UDP.
- d) The management-information database that the manager accesses to the agents is called an RDB.

Q46. How many common keys are necessary in total when 100 senders/receivers are to communicate with each other secretly using the common key cryptosystem?

- a) 200
- b) 4,950
- c) 9,900
- d) 10,000

Q47. Public-key cryptography is to be used to encrypt transmitted/received messages, thereby preventing wiretapping. Which of the following keys is used to encrypt messages when they are sent out?

- a) Private key of recipient
- b) Private key of sender
- c) Public key of recipient
- d) Public key of sender

Q48. Which of the following is a purpose of NIDS?

- a) It checks whether unauthorized entry is possible or not by actually attacking the site.
- b) It determines the size of the damage when attacks cannot be averted.
- c) It determines whether or not files on the server have been tampered with.
- d) It records attempts of unauthorized entry into the network being managed and reports them to the manager.

Q49. Which of the following is a security measure against attacks by cross-site scripting?

- a) The resident SNMP program detects any attacks on the Web server.
- b) The Web server is protected from intrusion by applying the security patch of the OS.
- c) When a Web application redisplay input data to the client, invalidate the script contained in the information.
- d) Writing data whose size exceeds allowable limits is prohibited, and thus the Web server is protected from intrusion.

Q50. Which of the following is an appropriate explanation of the TEMPEST technology and a measure against it?

- a) It is a technology against macro viruses; a countermeasure is to install anti-virus software and apply the most recent virus definition files.
- b) It is a technology that intercepts and analyzes communication contents from wireless LAN signals; a countermeasure is to encrypt communication packets.
- c) It is a technology that intercepts electromagnetic waves emitted from devices such as the display monitor and observes its contents; a countermeasure is to place the devices in a room that is insulated from electromagnetic waves.
- d) It is a technology that steals packets during data communication and tampers with the contents; a countermeasure is to implement a mechanism of tamper detection by digital signature.

Q51. Which of the following is used for the purpose of deliberately disclosing vulnerable hosts or systems in security and then observing the contents that were attacked?

- a) Honeypot
- b) IDS
- c) Incident response
- d) Spyware

Q52. Which of the following is an appropriate description concerning encryption of communication?

- a) An e-mail encrypted by S/MIME can be read as plain text by the mail manager while it is stored on the mail server on the receiving side.
- b) In the transport mode of IPsec, messages are encrypted on all paths between the sending system and the receiving system, not just on the communication paths between the gateways.
- c) When an LDAP client is connected to the LDAP server, its communication contents cannot be encrypted.
- d) When SSL is used for connection, an encrypted HTML document is always saved on the disk as the browser cannot set the existence of the cache.

Q53. Which of the following describes UCS-2 (Unicode)?

- a) It is a coded character set currently used on a large number of personal computers. An alphanumeric character is expressed using 1 byte, and a Chinese character is represented using 2 bytes.
- b) It is a coded character set in which each character is expressed using 1 byte.
- c) It is a coded character set in which each character is expressed using 2 bytes and which can support the various character sets used in different countries.
- d) It is a coded character set used primarily for UNIX. An alphanumeric character is expressed using 1 byte, and a Chinese character is represented using 2 bytes.

Q54. Which of the following is a correct statement concerning an information system's risk management?

- a) A risk refers to the possibility that a threat will exploit the vulnerabilities of information assets to cause loss or damage to the assets.
- b) A threat, which refers to the probability that a vulnerability will be overt, depends on the technological control installed in an information system.
- c) Risk assessment, which refers to the process of judging the magnitude of a risk and thereby establishing measures to deal with it, is broadly divided into risk aversion and risk reduction.
- d) Vulnerabilities, which refer to factors that have adverse effects on an information system, are broadly categorized into natural disasters, system faults, human errors, and misconducts.

Q55. Which of the following is an appropriate explanation of SAML (Security Assertion Markup Language)?

- a) It defines a mechanism for widely publicizing information concerning Web services, and allows searching functions which those services provide, etc.
- b) It defines a protocol for sending e-mail that is protected from eavesdropping, reading, and modification by unauthorized users.
- c) It defines a Web service protocol for efficiently managing information on key used for digital signatures.
- d) It defines a Web service protocol for transmitting authentication, attribute, and access control information to different domains.