

(一)選擇題(單選) 40題, 每題2分, 共80分, 請在每題的選項內選擇最適當的答案。

注意：答錯倒扣1分, 扣至零分為止。(不答不倒扣)

選擇題請在電腦閱卷之答案卡作答, 否則不予以計分。

1. Which of the following is not correct about communication protocols?  
(A) HTTP is for hypertext file transfer in WWW (B) SMTP is for email transmission (C) FTP is for transferring files between hosts (D) POP is for local e-mail clients to retrieve e-mail from a remote server (E) Telnet is for secure data communication and shell services with a remote host.
2. Which of the following is wrong in the OSI (Open Systems Interconnection) model?  
(A) layer 1 is physical (B) layer 2 is data link (C) layer 4 is transport (D) layer 5 is presentation (E) layer 7 is application.
3. Which of the following protocol is required for a computer to connect to the Internet?  
(A) WWW (B) UDP/IP (C) TCP/IP (D) HTTP (E) Ethernet.
4. Optical discs like CD-ROM commonly store items in \_\_\_\_\_.  
(A) random locations anywhere between the center of the disc and the edge of the disc (B) multiple pie-shaped sections that break a track into arcs (C) a single track that spirals from the center of the disc to the edge of the disc (D) a single track that spirals from the edge of the disc to the center (E) multiple concentric tracks from the center of the disc to the edge of the disc.
5. A set of hardware, software, people, policies, and procedures needed to create, manage, distribute, use, store, and revoke digital certificates:  
(A) public key infrastructure (B) certificate infrastructure (C) trusted-third party (D) open key infrastructure (E) open ID infrastructure.
6. With \_\_\_\_\_ memory, the operating system allocates a portion of a storage medium, usually the hard disk, to function as additional RAM.  
(A) swap (B) page (C) virtual (D) device (E) cache.
7. A multitasking operating system developed in the early 1970s at Bell Laboratories:  
(A) NetWare (B) UNIX (C) Linux (D) Solaris (E) FreeBSD.
8. Which of the following is wrong?  
(A) The process of starting or restarting a computer is called booting. (B) Cold boot refers to turning on a computer that has been powered off. (C) Hot start refers to using the operating system to restart a computer without turning the computer off. (D) A boot drive is the drive from which your computer starts. (E) All of the above are correct (choose this only if none of the above can be chosen.)
9. Which of the following techniques is used to allow a single server to host multiple clients, each of which has its own operating system?  
(A) time-sharing (B) distributed processing (C) parallel processing (D) virtualization (E) multi-threading.
10. In cloud computing's terminology, Gmail and Google Docs belong to which of the following services?  
(A) Platform as a Service (B) Software as a Service (C) Mail as a Service (D) Office as a Service (E) Utility as a Service.
11. The main advantage of a multi-dimensional database is:  
(A) there is a common query language SQL (B) the content of all dimensions is the same regardless of the subject (C) it can consolidate multi-attribute data much faster than a relational database (D)

- allow hypertext and hypermedia to be easily stored (E) allow relations to be expressed as tuples.
12. Among the following databases, which is the most popular and is available in open source?  
(A) Oracle (B) DB2 (C) MySQL (D) SQL Server (E) FoxPro.
13. A particularly devastating type of attacks in which multiple unsuspecting computers are used to attack multiple computer networks:  
(A) Zombie (B) Robot squad (C) vampire army (D) DDoS (E) BotNet.
14. When a mobile user connects to a main office using a standard Internet connection, a \_\_\_\_ provides the mobile user with a secure connection to the company network server.  
(A) value added network (VAN) (B) virtual private network (VPN) (C) Transport Layer Security (TLS) (D) secure socket network (SSN) (E) secure socket layer (SSL).
15. The system development cycle consists of (in order)  
(A) 1. planning, 2. analysis, 3. design, 4. implementation, 5. operation and support.  
(B) 1. planning, 2. review, 3. analysis, 4. implementation, 5. operation.  
(C) 1. planning, 2. design, 3. analysis, 4. implementation, 5. operation.  
(D) 1. analysis, 2. planning, 3. design, 4. implementation, 5. operation and support.  
(E) 1. analysis, 2. planning, 3. design, 4. implementation, 5. support and security.
16. Which of the following is wrong?  
(A) A decision table is a table that lists a variety of conditions and the actions that correspond to each condition (B) A decision tree also shows conditions and actions, but it shows them graphically. (C) The data dictionary stores the data item's name, description, and other details about each data item. (D) A class diagram graphically shows classes and subclasses in a system. (E) A flowchart illustrates how data is processed by a system in terms of inputs and outputs at each stage.
17. The process of analyzing data from different perspectives and summarizing it into useful information - information that can be used to increase revenue, cuts costs, or both:  
(A) artificial intelligence (B) data mining (C) information retrieval (D) data warehouse (E) machine learning.
18. Which of the following is not correct about RFID vs. barcode?  
(A) in terms of read speed, RFID tag is faster than barcode (B) multiple RFID tags can be read at a time (C) barcode can be read while it is moving (D) RFID tag can be used to store more information than a barcode (E) RFID stands for "Radio-frequency identification".
19. Which of the following SQL statement helps aggregate results by one or more columns?  
(A) GROUP BY (B) ORDER BY (C) INNER JOIN (D) LEFT JOIN (E) UNION.
20. Which of the following is not true about relational databases?  
(A) a relation is defined as a set of tuples that have the same attributes. (B) a relation is usually described as a table, which is organized into rows and columns. (C) a primary key uniquely defines a relationship within a database. (D) a foreign key is a reference to a key in another relation. (E) all of the above are correct (choose this only if none of the above can be chosen).
21. In database, the process of organizing the fields and tables of a relational database to minimize redundancy and dependency is called  
(A) normalization (B) standardization (C) compression (D) optimization (E) canonical form.
22. Which of the following is not true about object-oriented design?  
(A) a class represents a type of data (B) an object is an instance of a class (C) if a class X extends a class Y by adding more data and methods, then X is called the super class of Y (D) if a class X extends a class Y, then an instance of X is also a type of Y (E) all of the above are correct (choose this only if none of the above can be chosen).



23. In object-oriented design, the ability for a programming language to process values of different data types using a uniform interface is called  
(A) encapsulation (B) abstraction (C) polymorphism (D) interface (E) modularity.
24. Which of the following technologies has been popularly used to store URLs in an image so that users can use smartphones to scan the image to connect to the URLs?  
(A) EPC tags (B) QR code (C) smart barcode (D) 2<sup>nd</sup> Generation Barcodes (E) MaxiCode.
25. Currently, which one of the following is the main stream hard disk interface used in commodity-grade PCs?  
(A) SCSI (B) SATA (C) IDE (D) FDDI (E) USB.
26. A technology that combines multiple disk drive components into a logical unit so as to increase fault tolerance:  
(A) cloud storage (B) Storage area network (SAN) (C) RAID (D) Storage Farm (E) JBOD (Just a Bunch Of Drives).
27. Which of the following processor architecture is popularly used in smart and portable devices?  
(A) Pentium Dual Core (B) ARM (C) Atom (D) Xeon (E) Athlon.
28. A marketing strategy popularly used in social networks that relies on people to pass a marketing message to his friends so that the message can quickly attract a large audience through this friend-to-friend information dissemination process:  
(A) market segmentation (B) one-to-one (C) one-to-many (D) viral marketing (E) product placement.
29. A set of software components that adds specific abilities to a larger software application:  
(A) applets (B) plu- and-play (C) web services (D) drivers (E) plug-in.
30. A global e-commerce giant whose core business is to allow payments and money transfers to be made through the Internet:  
(A) PayPal (B) iCash (C) WebATM (D) FedEx (E) Alibaba.com.
31. Which of the following data structures is most suitable for implementing a breadth-first search on a graph?  
(A) Hash Table (B) Heap (C) List (D) Queue (E) Stack
32. Consider the implementation of a job scheduler to serve on-demand requests according to their priorities. Which of the following data structures is most suitable for temporarily storing the requests that are yet to be served?  
(A) Hash Table (B) Heap (C) List (D) Queue (E) Stack
33. A heap can be efficiently implemented as an array A with the root stored in A[1] and the left and the right children of A[i] stored respectively in A[2i] and A[2i+1]. Assuming the heap is a min heap, which of the following listings of the array elements (from A[1] to A[5]) cannot possibly be a stable state of the heap?  
(A) 1,2,3,5,4 (B) 1,3,2,5,4 (C) 1,2,4,3,5 (D) 1,4,2,3,5 (E) 1,2,5,4,3
34. Continue on the preceding question and assume that the listing of the elements in the heap (from A[1] to A[5]) is 1,3,2,4,5. What should the listing of the elements be, after a delete (or remove) operation?  
(A) 2,3,5,4 (B) 3,2,5,4 (C) 2,4,3,5 (D) 4,2,3,5 (E) 2,5,4,3
35. An algorithm is analyzed to be at most  $O(n^2)$ -time. Which of the following functions cannot possibly be the actual running time?  
(A)  $1.5n^{1.5}$  (B)  $2n^2$  (C)  $2.4n^{2.4}$  (D)  $n \log n$  (E)  $2^{\log n}$
36. Which of the following is not an in-place sorting algorithm?

- (A) Bubble Sort (B) Heapsort (C) Insertion Sort (D) Mergesort (E) Quicksort
37. Which of the following sorting algorithms is in-place and  $O(n \log n)$ -time in the worst case?  
(A) Bubble Sort (B) Heapsort (C) Insertion Sort (D) Mergesort (E) Quicksort
38. Which of the following statements about (undirected) graphs and trees is incorrect?  
(A) Every graph has at least one spanning tree.  
(B) A connected graph with  $n$  vertices and  $n-1$  edges must be a tree.  
(C) A spanning tree of a graph  $G$  is a maximal connected subgraph of  $G$  without cycles.  
(D) A tree is a connected graph without cycles.  
(E) A tree of  $n$  vertices has exactly  $n-1$  edges.
39. A directed graph is \_\_\_\_\_ if there is a directed path from every vertex to every other vertex.  
(A) biconnected (B) connected (C) regularly connected (D) strongly connected (E) tightly connected
40. NP is an important class of algorithmic decision problems. Which of the following pairs of words best define the term NP?  
(A) Nondeterministic/Polynomial (B) Nondeterministic/Precise (C) Not/Polynomial (D) Not/Precise (E) Not/Problem

(二)問答題 2 題，每題 10 分，共 20 分。  
請在答案卷內依序作答，否則不予以計分。

1. How can a search tree be adapted and used for sorting? What is the best time complexity that such a sorting algorithm may achieve? Please explain.
2. Design an algorithm that computes the length (number of edges) of the longest directed path for a given acyclic directed graph; a directed graph is acyclic if it does not contain any cycle. Please describe the algorithm in suitable pseudo code and explain how it works.

試題隨卷繳回