國立中山大學 109 學年度
碩士暨碩士專班招生考試試題

科目名稱：計算機概論【資管系碩士班甲組、乙組】

單選題(每題 2.5 分，共 40 題，總計 100 分)

1. For any given 8-bit variable x, which of the following C bitwise operations does not result in 0?
   A. x &= (~x)
   B. x |= x
   C. x ^= x
   D. x <<= 8

2. Which of the following about Data Lake is FALSE?
   A. A data lake is a system/repository that stores relational data.
   B. A data lake often refers to a way to manage big data.
   C. Apache Hadoop Distributed File System can be used as an implementation of the data lake.
   D. Many cloud service providers are currently providing different implementations of the data lake.

3. Which of the following is NOT a common type/application of big data analytics?
   A. Descriptive Analytics
   B. Predictive Analytics
   C. Perspective Analytics
   D. Prescriptive analytics

4. Which of the following about in-database analytics is FALSE?
   A. Apache Spark is often used as the engines of the in-database computing.
   B. SQL is the primary data processing language of the in-database analytics.
   C. Massive parallel processing database system is a kind of implementation of the in-database analytics
   D. In-database analytics focuses more on processing relational data.

5. Given that
   $H(x)$ means "x is a human"
   $M(x)$ means "x is mortal"

   What is the logical translation of the statement "all humans are mortal"?
   A. $\forall x(H(x) \wedge M(x))$
   B. $\exists x(H(x) \wedge \neg M(x))$
   C. $\forall x(\neg H(x) \wedge \neg M(x))$
   D. $\exists x(H(x) \wedge M(x))$

6. Which of the following about Apache Spark is FALSE?
   A. Spark is commonly considered an in-memory processing engine.
   B. Spark Resilient Distributed Dataset (RDD) provides a kind of fault tolerant mechanism.
   C. Function *filter()* is an action of the RDD.
   D. A transformation of the RDD is usually lazy-evaluated.

7. Consider below C/C++ statement. Which of the following about variable *ptr* is FALSE?

   const int *ptr;

   A. The memory address saved in *ptr* can be modified.
   B. The data value of the object that *ptr* points to can be modified.
   C. *ptr* is a pointer variable that points to an object of type *int*
   D. The C statement *ptr = &y;* is valid.

8. What value does below C/C++ function *func()* return when called with a value of 6?

   ```
   int func(int n){
     if(n <= 1) return 1;
     else return n * func(n - 1);
   }
   ```

   A. 1
   B. 6
   C. 720
   D. 120

9. In C/C++ programming, opening a file will return a(n) _____ to a FILE structure.

   A. NULL
   B. file name
   C. EOF
   D. pointer

10. Consider a C/C++ implementation of a stack. Which of the following statements is FALSE?

    A. Stacks are last-in first-out (LIFO) data structures.
    B. Stacks cannot be implemented using linked lists.
    C. The new nodes can only be added to the top of a stack.
    D. The last node of the stack has a NULL link.

11. Which of the following about data structures is FALSE?
    A. The length of a linked list is often fixed.
    B. Data in a linked list can be stored in arrays.
    C. Arrays can become full.
    D. The length of a linked list is limited to the available memory.

12. Which of the following about bubble sort is TRUE?
    A. Its worst-case complexity is $O(n^2)$,
    B. It is not a comparison sort.
    C. It is a divide-and-conquer sorting algorithm
    D. It compares random pairs of elements.

13. Consider the following tables, A and B, in a relational database.

A:

ID	V1
1	A
3	X
5	C

B:

ID	V2
3	X
5	Y
6	Z

How many rows and columns in the output after running the following SQL query?

SELECT * FROM A INNER JOIN B ON A.ID = B.ID

    A. 3 rows and 3 columns
    B. 2 rows and 4 columns
    C. 2 rows and 3 columns
    D. 2 rows and 2 columns

14. In Python 3, which of the following data type is considered a flexible container that stores various data types?
    A. List
    B. Dictionary
    C. Tuple
    D. Set

15. Which of the following statement about Programming and Machine Learning (ML) is FALSE?
    A. ML is often considered a new programming paradigm.
    B. Building ML systems/models does not require any programming.
    C. In programming, humans need to input rules/instructions and data to be processed.
    D. In ML, models are trained without explicitly programmed.

16. Which of the following is considered a kind of unstructured data?
    A. JSON files
    B. Tabular data in relational databases
    C. XML files
    D. Video files

17. Consider the following relation R:

R:

X	Y	Z
3	2	8
8	9	2
8	2	8
5	3	5

Which of the following functional dependencies does not hold on R?
A. Y->Z
B. Z->Y
C. X->Z
D. XY->Z

18. Consider a relation R(A, B, C, D). Which of the following relational schema is NOT in 3NF (Third Normal Form)?
A. { A->BC, C->D }
B. { AB->CD, C -> B }
C. { C->AB, B -> CD }
D. { A->BCD, B->D }

19. Which of the following about C/C++ pointer is FALSE?
A. It is used to represent memory address
B. It can be assigned to other pointers of different types
C. It can be assigned to void
D. It can be assigned to an array

20. Which of the following statements is FALSE?
A. The call stack grows as functions are called and shrinks as functions complete.
B. The amount of memory is finite in computers, so too many function calls can lead to stack overflow.
C. Stack frames contain information for active functions/subroutines: parameters, local variables and the return address.
D. The call stack stores dynamically allocated program objects.

21. TCP/IP is a network protocol that defines rules for breaking messages into _____ that are the basic unit of network communication.
A. pages
B. bytes
C. packets
D. bits

22. Which of the following about deadlock is FALSE?
    A. Deadlock prevention ensures that the system will never enter deadlocked state.
    B. A cycle in a resource-allocation graph is a necessary and sufficient condition for deadlock in the case that each resource has multiple instances.
    C. Deadlock avoidance disallows deadlock by trying to determine if allowing a particular resource allocation will cause deadlock.
    D. Most operating systems, including UNIX and Windows, choose to ignore deadlocks because deadlocks occur infrequently.

23. Which of the following about artificial intelligence (AI) is FALSE?
    A. Facial recognition technology can be applied to diagnose patients in healthcare without considering ethical issues.
    B. Deepfake algorithms can create fake images and videos using neural networks.
    C. Deep learning is a sub-field of machine learning, which is a set of algorithms inspired by the structure and function of the brain.
    D. AI algorithms can help companies to make business predictions better.

24. Which of the following about virtual memory is FALSE?
    A. The area of the hard drive used for virtual memory is called a swap file.
    B. With virtual memory, processes can run without being fully loaded into memory.
    C. A good page replacement algorithm can reduce the number of pages faults and improve performance.
    D. The paging technique that swaps data between memory and storage increases the memory utilization and system performance.

25. _____ is a technique that can transfer data, usually audio and video, in a continuous flow over the Internet, which allows users to access the content while it is transmitting.
    A. Streaming
    B. Broadcasting
    C. Spooling
    D. Multitasking

26. Which of the following about sorting methods is FALSE?
    A. Quick sort takes $O(n^2)$ time in the worst case to sort an array of n elements.
    B. Merge sort takes $O(n^2)$ time in the worst case to sort an array of n elements.
    C. Selection sort takes $O(n^2)$ time in the worst case to sort an array of n elements.
    D. Insertion sort takes $O(n^2)$ time in the worst case to sort an array of n elements.

27. Breadth-first search (BFS) is a search algorithm used for finding a shortest path in graph. Which data structure is often adopted in BFS implementation?
    A. Stack
    B. Binary search tree
    C. Queue
    D. Red-black tree

28. When logging in to an account on a computer, users enter a user ID and a password. Then, they enter another authentication code, which is sent as text or voice message on a mobile device. This process is referred to as _____.
    A. two-step verification
    B. mobile authentication
    C. passcode authentication
    D. voice verification

29. Which of the following is NOT an image file format?
    A. TIFF
    B. PNG
    C. JPEG
    D. MOV

30. In the context of mobile phones or tablets, _____ allows a phone or tablet to share its Internet connection with other computers and devices wirelessly.
    A. broadcasting
    B. tethering
    C. bandwidth sharing
    D. networking

31. Pokémon Go is a location-based, mobile device game that allows players to locate, capture and train creatures in the real world as well as take selfie pictures with their creatures. Which technology enables this feature?
    A. Virtual reality
    B. Mixed reality
    C. Augmented reality
    D. Simulation reality

32. Which of the following about operating systems is TRUE?
    A. macOS is made for Apple's mobile devices.
    B. Chrome OS is a Linux-based operating system.
    C. Windows is open source software that provides a graphical user interface.
    D. An operating system cannot run from a USB flash drive.

33. How many bytes are in an IPv6 address?
    A. 4 bytes
    B. 16 bytes
    C. 32 bytes
    D. 128 bytes

34. Which of the following is a commonly adopted method for finding the position of an element from a large sorted array?
    A. Linear search
    B. Quick sort
    C. Depth-first search
    D. Binary search

35. Which of the following about Internet and network attacks is FALSE?
    A. Phishing is a scam in which a fraudster sends an official looking email message that attempts to obtain personal data or login credentials.
    B. Spoofing is a technique that intruders use to make their network or Internet transmission appear legitimate to a victim computer or network.
    C. Adware is a program that locks the user out of his/her computer until a specified amount of money is paid.
    D. A backdoor is a program that allows users to bypass normal authentication procedures when accessing a program, computer, or network.

36. Which technology is used for contactless payment?
    A. Near field communication (NFC)
    B. Bluetooth
    C. Peer-to-peer (P2P) network
    D. Radio frequency identification (RFID)

37. Which of the following about the 32-bit IEEE standard for floating point arithmetic (IEEE 754) is FALSE?
    A. The sign bit 1 is for the decimal number -11.5 in the 32-bit IEEE format.
    B. The exponent filed is 00000011 for the decimal number -11.5 in the 32-bit IEEE format.
    C. Twenty three bits are allocated for the significand.
    D. Normalized binary numbers always start with a 1, and the significand is codded with implied leading 1.

38. Which of the following is the core technology used in Amazon Go, the Amazon's new, checkout free grocery and convenience store?
    A. AI planning
    B. Natural language processing
    C. Speech recognition
    D. Computer vision

39. Which of the following statements about the TCP/IP model is TRUE?
    A. The TCP/IP model is a scalable, client-server architecture.
    B. TCP/IP stands for Transaction-centered Protocol/Internet Protocol and it contains 4 layers.
    C. The transport layer is closest to the end user.
    D. UDP is a connection-oriented protocol that reliably transmits data from the source to the destination.

40. Google Docs allow users to create and manage documents over the Internet, which is an example of
_____.
   A. IaaS
   B. SaaS
   C. PaaS
   D. DaaS

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科目名稱：管理資訊系統【資管系碩士班甲組】

－作答注意事項－

考試時間：100 分鐘

- **考試開始鈴響前不得翻閱試題，並不得書寫、劃記、作答。**請先檢查答案卷（卡）之應考證號碼、桌角號碼、應試科目是否正確，如有不同立即請監試人員處理。

- **答案卷限用藍、黑色筆(含鉛筆)書寫、繪圖或標示，**可攜帶橡皮擦、無色透明無文字墊板、尺規、修正液（帶）、手錶(未附計算器者)。每人每節限使用一份答案卷，不得另攜帶紙張，請衡酌作答。

- 答案卡請以 2B 鉛筆劃記，不可使用修正液（帶）塗改，未使用 2B 鉛筆、劃記太輕或污損致光學閱讀機無法辨識答案者，其後果由考生自行負擔。

- 答案卷（卡）應保持清潔完整，不得折疊、破壞或塗改應考證號碼及條碼，亦不得書寫考生姓名、應考證號碼或與答案無關之任何文字或符號。

- 可否使用計算機請依試題資訊內標註為準，如「可以」使用，廠牌、功能不拘，唯不得攜帶具有通訊、記憶或收發等功能或其他有礙試場安寧、考試公平之各類器材、物品（如鬧鈴、行動電話、電子字典等）入場。

- **試題及答案卷（卡）請務必繳回，未繳回者該科成績以零分計算。**

- **試題採雙面列印，考生應注意試題頁數確實作答。**

- **違規者依本校招生考試試場規則及違規處理辦法處理。**

1. 雲端運算的採用有哪些優缺點與風險？與傳統資訊委外服務有何差異性？（10%）

2. 平台經濟中，常提到所謂的網路效應(Network Effect)，試問何謂網路效應？有哪些型態的網路效應？（15%）

3. 電子商務中，最主要的便是行銷議題，這也是有別於傳統商務，最有特色的一環。試問現行的數位行銷管道有哪些呢？針對時下流下的 youtuber 與網紅，會建議他們採用什麼行銷策略呢？（25%）

4. 何謂資料科學(Data Science)?何謂大數據(Big Data)?大數據所使用的硬、軟體及分析工具架構如何？（25%）

5. 電腦視覺(Computer Vision)與自然語言處理(Natural Language Processing)是人工智慧(AI)兩個最重要的核心技術領域，請問在這兩個核心技術領域之下，有哪些重要的人工智慧技術及應用？（25%）

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科目名稱：資料結構【資管系碩士班乙組】
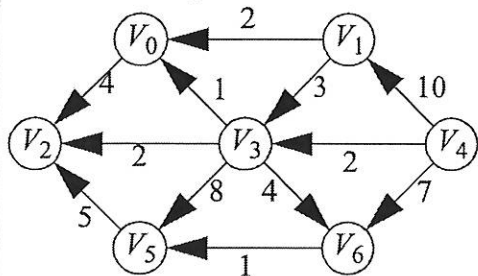
共 25 題選擇題，每題 4 分，第 1~24 題為單選題，第 25 題為複選題

1. Items 7, 3, 11, 9, and 13 are inserted into an AVL tree. What happens when 12 is inserted?
A. No rotation is needed
B. A single rotation between some node and its left child is performed
C. A single rotation between some node and its right child is performed
D. A double rotation with a node, its left child, and a third node is performed
E. A double rotation with a node, its right child, and a third node is performed

2. Which of the following trees can have height that is not logarithmic?
A. AA tree
B. AVL tree
C. B-tree of order 4
D. Red black tree
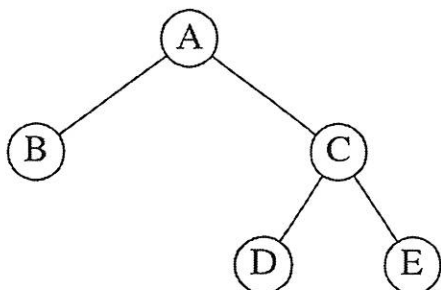E. All of the above trees must have logarithmic depth

The next two questions refer to the following graph:

3. If the start vertex is V4, then using the acyclic weighted shortest path algorithm, which is the last vertex to be declared known?
A. V0
B. V1
C. V2
D. The graph is not acyclic, so the acyclic algorithm should not be used
E. None of the above

4. If the start vertex is V4, then using the standard weighted shortest path algorithm, which is the last vertex to be declared known?
A. V0
B. V1
C. V2
D. V4
E. None of the above

The next two questions relate to the tree below:

5. Which of the following is an in-order traversal of the tree?
A. ABCDE
B. ABDCE
C. BDECA
D. EDCBA
E. None of the above

6. Suppose the post-order iteration is performed on the tree. At the time that D is output, what symbols are still on the stack?
A. A only
B. A and B, only
C. A and C, only
D. A, B, and C
E. None of the above

7. Which of the following sorting algorithms has the lowest worst-case time complexity?
A. Selection sort
B. Merge sort
C. Bubble sort
D. Insertion sort
E. Quick sort

8. What is the height of a complete binary tree with 16384 nodes?
A. 8192
B. 13
C. 14
D. 15
E. 16

9. A node with key 8 has a left child with key 10. Which of the following objects could this node be found in?
A. Binary search tree
B. Max heap
C. Min heap
D. Two of the above
E. None of A, B, and C

10. Suppose we are implementing quadratic probing with a hash function Hash(X) = X mod 100. If an element with key 4592 is inserted and the first three locations attempted are already occupied, then the next cell that will be tried is
A. 0
B. 1
C. 9
D. 92
E. 95

11. For the array implementation of the stack, what is the worst-case cost of a single push operation if array doubling is used?
A. O(1)
B. O(log N)
C. O(N)
D. O(N log N)
E. None of the above

12. If a header node is used in a linked list, which of the following indicates a list with one item?
A. header != NULL
B. header == NULL
C. header != NULL && header->next == NULL
D. header != NULL && header->next != NULL && header->next->next == NULL
E. None of the above

13. Which of the following characterizes a Huffman coding tree?
A. All items are stored at the leaves
B. No nodes have one child
C. The tree is balanced
D. A and B only
E. All three of A, B and C

The next two questions apply to the following code fragment:
```
1   for( int i = 0; i < n; i++ )
2       for( int j = i; j <= n; j++ )
3           for( int k = i; k <= j; k++ )
4               sum++;
5   for( int p = 0; p < n*n; p++ )
6       for( int q = 0; q < p; q++ )
7           sum--;
```

14. How many times is statement 4 executed?
A. O(N)
B. O(N^2)
C. O(N^3)
D. O(N^4)
E. None of the above

15. How many times is statement 7 executed?
A. O(N)
B. O(N^2)
C. O(N^3)
D. O(N^4)
E. None of the above

16. What is the running time of the following routine?
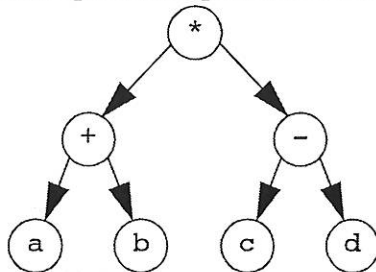```
bool isPrime(int n) {
    if(n == 2 || n == 3)
        return true;
    if(n % 2 == 0)
        return false;
    for(int i = 3; i <= squareRoot(n); i+=2)
        if(n % i == 0)
            return false;
    return true;   }
```
A. O(1)
B. O(log $N$)
C. O($N$)
D. O($N^{1/2}$)
E. None of the above

17. Which data structure is used by the compiler to implement recursion?
A. Map
B. Priority queue
C. Queue
D. Set
E. Stack

18. What postfix expression does the expression tree below represent?



A. a + b * c - d
B. ( a + b ) * ( c - d )
C. a b + c d - *
D. a b c d + - *
E. None of the above
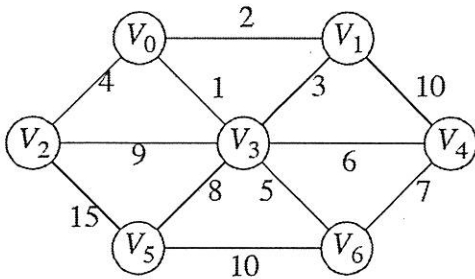
19. Which of the following represents an infix expression followed by the postfix equivalent?
A. a+b-c and a b c - +
B. a+b*c and a b c * +
C. a+b*c and a b c + *
D. a+b*c and a b + c *
E. More than one of the above

20. The items 3, 6, 5, 2, 4, 7, 1 are inserted into a binary search tree. Which node is the deepest?
A. 1
B. 3
C. 4
D. 7
E. None of the above

21. What is the cost of the minimum spanning tree for the following graph?



A. 24
B. 25
C. 26
D. 27
E. None of the above

22. Approximately what is the maximum height of a binary search tree of $N$ nodes?
A. $\log N$
B. $1.38 \log N$
C. $1.44 \log N$
D. $2 \log N$
E. None of the above

23. Which operation is not supported in constant time by a double-ended queue?
A. Insertion at the front or rear item
B. Access of the front or rear item
C. Deletion of the front or rear item
D. Access and deletion of the minimum item
E. All of the above are supported

24. Which of the following algorithm types classifies Huffman's algorithm?
A. Backtracking algorithm
B. Divide and conquer algorithm
C. Dynamic programming algorithm
D. Greedy algorithm
E. None of the above

25. (複選)Which ones of the following are true?
A. A full binary tree is a complete binary tree, and vice versa
B. When using a max heap to implement a priority queue, the time complexity of both the push and pop operations are O($\log N$)
C. The stack operations are according to the last-in first-out principle
D. The average time complexity of finding an element in a binary search tree is O($N$)
E. The linked list operations are according to the last-in first-out principle

試題請隨卷繳回，請留意背面是否有題