

國立彰化師範大學115學年度碩士班招生考試試題

系所：資訊管理學系(選考甲)、

科目：計算機概論

資訊管理學系數位內容科技與管理碩士班

☆☆請在答案紙上作答☆☆

共4頁，第1頁

一、單選題(60%，每題3%)

- Three security goals are _____, integrity, and availability.
(A) cryptography (B) confidentiality (C) nonrepudiation
(D) denial of service (E) none of the above
- The values of an object's fields (variables) at a given time define the object's _____.
(A) type (B) speed (C) parameter (D) result (E) none of the above
- _____ is a technique that allows programs to use more memory than physically available.
(A) File swapping (B) Virtual memory (C) Disk swapping
(D) Hot swapping (E) none of the above
- The execution time of _____ language is the best.
(A) BASIC (B) C++ (C) Java (D) Python (E) none of the above
- The swap function usually uses the pass by _____ mechanism for most high-level programming languages that support it.
(A) value (B) type (C) signature (D) parameter (E) none of the above
- In Java, the statements `int x=5; int y=6; int z = (y > x++) ? 1 : 0;` the value of z is _____.
(A) 1 (B) 0 (C) compilation error (D) runtime error (E) none of the above
- _____ use(s) a hybrid compiler/interpreter approach?
(A) C++ (B) Python (C) Java (D) Python and Java (E) none of the above
- $(1111)_2 \text{ XOR } (0110)_2$ is $(\text{_____})_2$.
(A) 1111 (B) 1011 (C) 1101 (D) 0000 (E) none of the above
- _____ is a modern high-performance storage interface used in enterprise servers.
(A) IDE (B) SAS (C) SCSI (D) SATA (E) none of the above
- If you make a mask of all 0s and then perform the "AND" operation of the bit pattern and the mask, you _____.
(A) complement the bits of the pattern (B) unset all the bits of the pattern
(C) set all the bits of the pattern (D) do nothing to the bits of the pattern
(E) none of the above
- CPU and I/O _____ connect directly.
(A) can easily (B) cannot (C) are able to (D) may not (E) none of the above
- The only difference between how the CPU reads and writes memory and I/O devices is the _____.
(A) bus (B) firmware (C) hardware (D) instruction (E) none of the above
- When sampling an audio signal, _____ is usually used to represent its amplitude.
(A) wave (B) quantization (C) level (D) code (E) none of the above

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14. What decimal do you get when you add 4 to 127 in the 8-bit two's complement format?
(A) 131 (B) 3 (C) -126 (D) -125 (E) none of the above
15. A _____ is a connecting device that segments traffic in the same network.
(A) repeater (B) bridge (C) router (D) gateway (E) none of the above
16. _____ occurs in priority scheduling when a low-priority process keeps waiting indefinitely because higher-priority processes continuously get the CPU.
(A) Stop and go (B) Wait and go (C) Starvation (D) Deadlock (E) none of the above
17. Assuming 1000 positive integers are stored in an unordered list, _____ search algorithm has the best performance.
(A) linear (B) depth first (C) breadth first (D) binary (E) none of the above
18. A circular queue of size 4 (array indices 0..3) uses the following rules:
Initially: front = 0, rear = 0
Queue is empty when front == rear
Queue is full when (rear + 1) % 4 == front
Rear always points to the next available index
After enqueue(), rear points to next index
After dequeue(), front points to next index
After the operations of enqueue(1); enqueue(2); enqueue(3); dequeue(); enqueue(4); enqueue(5);
Which statement is correct?
(A) enqueue(5) succeeds and overwrites element 1
(B) enqueue(5) fails because the queue is full
(C) the queue contains exactly 4 elements after all operations
(D) the element dequeued is 5
(E) none of the above
19. A singly linked list containing n elements where each node points only to the next node. Which of the following operations is O(1) in the worst case?
(A) Access the element at index n/2
(B) Insert a new node after a given node whose address is known
(C) Delete the last node in the list
(D) Search for a key value in the list
(E) none of the above
20. A packet of size 1,500 bytes is transmitted over a link with: bandwidth=10Mbps, propagation delay=20ms, no queuing delay, no processing delay; What is the total end-to-end delay for a single packet?
(A) 20ms (B) 21.2ms (C) 22ms (D) 22.2ms (E) none of the above

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二、Short Answer Questions(40%)

21. (6%) Regarding demand paging (DP) and demand segmentation (DS) in virtual memory management, please fill in the blanks below with "DP" or "DS".

For example: DP may suffer from trashing and frequent page faults.

- (a) _____ is better for large, logically structured programs.
- (b) _____ is best when applications with unpredictable memory access patterns.
- (c) _____ is better when the locality of reference is important.

22. (6%) Consider the following recursive function:

```
int mystery(int n) {  
    if (n <= 1)  
        return 1;  
    return mystery(n/2) + mystery(n/2);  
}
```

- (a) What is the time complexity in Big-O notation? You have to explain how do you get this conclusion.
 - (b) What is the maximum stack depth (number of active function calls) when calling mystery(1024)? You have to show all the calculation steps.
23. (12%) The following Java program calculates the distribution range of student scores between 0 and 100, and divides the scores into 10 intervals. Please fill in the blanks below.

```
public class ScoreDistribution {  
    public static void main(String[] args) {  
        int[] scores = {90, 38, 59, 89, 40, 78, 81, 93, 65, 79, 69, 62, 74, 85, 73, 77};  
        int[] dist = _____; // array holding the score distribution range  
        for (int score : scores) { // loop through each score and determine which interval it falls into  
            int index = _____; // the range index, e.g. 38 goes into the 3th index  
            if (score == 100) { // special case for score 100  
                _____;  
            }  
            _____; // increment the count for this range  
        }  
        System.out.println("Score Distribution:");  
        for (int i = 0; i < dist.length; i++) {  
            int lb = i * 10; // lower bound  
            int up = (i == 9) ? 100 : (i + 1) * 10 - 1; // upper bound  
            System.out.println(" Score " + lb + "~" + up + ": " + dist[i] + " student(s)");  
        }  
    }  
}
```

OUTPUT:

Score Distribution:

Score 0~9: 0 student(s)

.....

Score 90~100: 2 student(s)

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24. (6%) The four characteristics of relational DBMS are ACID which have been relaxed to BASE in NoSQL DBMS.

(a) “C” in ACID stands for _____.

(b) “I” in ACID stands for _____.

(c) “E” in BASE stands for _____.

25. (10%) The concert ticketing system in Taiwan often crashes the moment it opens for bookings. This is a classic flash-crowd(快閃盲群)/thundering-herd(羊群效應) problem combined with strong consistency requirements, causing the problems of (1) extreme burst traffic (100k – 500k users in seconds), (2) strong consistency (no overselling seats), (3) synchronous dependencies (seat lock→payment→confirmation), and (4) shared bottlenecks (DB row locks). To resolve the above issue, please select the best and only one option from the following statements (只能挑選一個選項，c小題中有2小題).

(a) To overcome (1), a virtual waiting room is designed which uses CDN (Content Delivery Network) edge workstations. The purpose is to only allow N users/sec into backend. For this, the following data structure can be used in the virtual waiting room: (Alist Bstack Cqueue Dbinary tree Ehash table)

Explain your choice:

(b) To overcome (2), a relaxed consistency DBMS which pre-allocates seat inventory into memory atomic store can be used. For this, the best DBMS is: (AMySQL BRedis (in-memory) CMongoDB (document-oriented) DNeo4j (graph-oriented) EOracle)

Explain your choice:

(c) To overcome (3) and (4), a combination of soft lock with decouple payment techniques can be used. For this, (Atemporary Bfixed Cany)seat tokens and (Dsynchronous Easynchronous Ftime-out) callbacks should be used so that if user abandons payment, the seat returns automatically, and the payment latency does not block the seat inventory system.

Explain your choice: