國立中山大學113學年度
學士後醫學系招生考試試題

科目名稱：計算機概論與程式設計

—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，後果由考生自負。
- 答案卡應保持清潔完整，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。
- 不可使用計算機，並不得攜帶書籍、紙張(應考證不得做計算紙書寫)、具有通訊、記憶、傳輸或收發等功能之相關電子產品或其他有礙試場安寧、考試公平之各類器材入場。
- 試題及答案卡請務必繳回，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。

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科目名稱：計算機概論與程式設計

※本科目依簡章規定「不可以」使用計算機(選擇題)

選擇題(單一選擇題，共50題，總分150分)

【單選題】每題3分，答錯1題倒扣0.75分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

1. Which one of the following is NOT a wireless technology?
   (A) Bluetooth
   (B) 5G
   (C) WiFi
   (D) NFC
   (E) Ethernet
   Ans: (E)

2. Which one of the following models is NOT considered as a deep learning method?
   (A) CNN
   (B) SVM
   (C) LSTM
   (D) RNN
   (E) GNN
   Ans: (B)

3. Which of the following structures is the most commonly-used directory structure?
   (A) Single level directory structure
   (B) Two level directory structure
   (C) Tree directory structure
   (D) Graph directory structure
   (E) None of the above
   Ans: (C)

4. Which of the following statements is the most likely SQL statement used to perform the following task: a bank gives 2% interest of all customers whose balance is less than 100,000?
   (A) UPDATE balance a SET a.balance = a.balance * 1.02 WHERE a.balance < 100000
   (B) UPDATE balance a SET a.balance += a.balance * 1.02 IF a.balance < 100000
   (C) UPDATE account a SET a.balance = a.balance * 1.02 WHERE a.balance < 100000
   (D) UPDATE account a SET a.balance += a.balance * 1.02 IF a.balance < 100000
   (E) None of the above
   Ans: (C)

5. Which one of the following binary representation is the two's compliment of -107?
   (A) 0110 1011
   (B) 1001 0100
   (C) 1001 0101
   (D) 1110 1011
   (E) 0110 1100
   Ans: (C)

6. For a three-dimensional array A stored in the *row-major order* with dimensions 3x4x5, if the address of A[0][2][4] is 2048 and the address of A[1][2][2] is 2084, then what is the address of A[2][1][2]?
   (A) 2112
   (B) 2114
   (C) 2122

(D) 2124
(E) None of the above
Ans: (B)

7. You create a car with *mycar = Car(4, 2)*. Which is a line of code to change the color of *mycar* to "red"?

```
class Car(object):
 def __init__(self, w, d):
   self.wheels = w
   self.doors = d
   self.color = ""

 def paint(self, c):
   self.color = c
```

(A) Car.paint("red")
(B) mycar.paint(red)
(C) mycar.paint("red")
(D) mycar.paint(Car, "red")
(E) None of the above
Ans: (C)

8. What is the status of a process right after the process has been stopped because its time slot is over?
(A) Ready
(B) Waiting
(C) Running
(D) Terminated
(E) Sleeping
Ans: (A)

9. Assume there are seven characters, C1, C2, C3, C4, C5, C6, and C7, and the frequency (in parentheses) of each one is given as follows.
C1(24), C2(5), C3(7), C4(50), C5(11), C6(16), C7(101)
What is the correct encoded length of a given character as the following if the Huffman coding is adopted?
(A) C1 for 2 bits
(B) C2 for 6 bits
(C) C3 for 7 bits
(D) C6 for 3 bits
(E) C7 for 2 bits
Ans: (B)

10. What is the output of the following Python code?

```
arr = ['1','2','3','4','5','6']
print(arr[1:2])
```

(A) ['2', '3', '4', '5', '6']
(B) ['2']

(C) []
(D) ['1']
(A) ['1', '2']
Ans: (B)

11. Symmetric encryption is commonly used to protect messages exchanged between two users without being exposed, where it is required to share a common secret key between the sender and receiver. If there are 20 users in a system, how many keys in total required to be shared among those users for the end-to-end security by symmetric encryption?
(A) 10
(B) 20
(C) 380
(D) 190
(E) 19
Ans: (D)

12. For the given array a=[6, 10, 5, 7, 8], using the following code for bubble sort:

```
for(int i = 0; i < 5; i++){
    for(int j = i+1; j < 5; j++){
        if(a[j] < a[i]){
            int temp = a[j];
            a[j] = a[i];
            a[i] = temp;
        }
    }
}
```

How many swaps are needed during the sorting process?
(A) 2
(B) 3
(C) 4
(D) 5
(E) 6
Ans: (C)

13. Consider the arithmetic right shift operation (SRA) in computer architecture. If we perform an SRA on the binary number 11011010 (assuming it represents a signed 8-bit two's complement integer), shifting it to the right by 2 positions, what is the decimal equivalent of the result?
(A) -26
(B) -49
(C) -10
(D) -13
(E) 54
Ans: (C)

14. Which of the following is the correct evaluation result of the postfix expression "826+*263/++"?
(A) 26
(B) 34
(C) 68

(D) 72
(E) None of the above
Ans: (C)

15. An algorithm that runs in $O(\sqrt{N})$, where N is the size of the problem. For $N = 100$, the time the algorithm runs is 1 minute. How long does the algorithm take for $N = 1000$?
(A) Same time
(B) About 3 minutes
(C) About 10 minutes
(D) About 30 minutes
(E) None of the above
Ans: (B)

16. Mathematical arithmetic in program A^(-B)+C is presented in an infix notation, if it is changed to a postfix notation, the result should be which of the following?
(A) AB-^C+
(B) AB-C+^
(C) +^A-BC
(D) ^A+-BC
(E) ^AB-C
Ans: (A)

17. Which is NOT the primary features of the blockchain technology?
(A) Distributed ledger
(B) Immutability
(C) Decentralization
(D) High security
(E) Low computational complexity
Ans: (E)

18. In the context of networking protocols, what differentiates TCP (Transmission Control Protocol) from UDP (User Datagram Protocol), and how does this difference impact data transmission?
(A) TCP is connection-oriented and ensures reliable, ordered data delivery, while UDP is connectionless and provides faster but potentially unreliable data transmission.
(B) TCP and UDP are both connectionless protocols, but TCP is designed for multimedia streaming, whereas UDP is optimized for file transfers.
(C) TCP is a low-level protocol used for local network communication, while UDP is a high-level protocol employed for wide-area network connections.
(D) TCP and UDP serve the same purpose in networking and are interchangeable depending on the application's requirements.
(E) TCP and UDP are identical, and the choice between them are arbitrary based on personal or organizational preferences.
Ans: (A)

19. A confusion matrix is commonly used to estimate the performance of a trained machine learning model for classification. Through the prediction on a set of test data not being used for model training, one can calculate the evaluation metrics, such as accuracy, precision, recall and F1 score. There are four kinds of results for the prediction by a model on a test dataset of 1000 tuples. That is, TP (true positive) = 500, FN (false negative) = 100, FP (false positive) = 50, and TN = 350 (true negative). What is the value of recall for the model?

(A) 500/600
(B) 500/550
(C) 850/1000
(D) 350/400
(E) 100/400
Ans: (A)

20. The MMU's main service to the computer is
(A) memory translation.
(B) memory allocation.
(C) memory transfer.
(D) memory collection.
(E) None of the above.
Ans: (A)

21. Consider the execution of the following set of processes on a single-core processor.

Process	Creation Time	Required Execution Time
P1	0	30
P2	5	12
P3	12	18
P4	70	20
P5	80	10

Assume we use first-in-first-out (FIFO) scheduling to execute the above 5 processes. What is the average waiting time?
(A) 13
(B) 33.4
(C) 18
(D) 0
(A) 27.4
Ans: (A)

22. Assuming that *t* is an array and *tPtr* is a pointer pointing to the first element of that array and no errors are encountered during the compilation. What expression refers to the address of the k^{th} element?
(A) *(t + k)
(B) &tPtr[k]
(C) &t[k-1]
(D) *(t+k-1)
(E) None of the above
Ans: (C)

23. What is the role of an operating system's "*scheduler,*" and how does it contribute to the efficient execution of processes?
(A) The scheduler is responsible for managing input/output operations within the operating system, ensuring seamless communication between peripherals and applications.
(B) It controls the allocation of system resources, such as CPU time, memory, and peripherals, to different processes, enhancing overall system performance.
(C) The scheduler is primarily focused on handling user authentication and authorization, ensuring

secure access to the operating system.

(D) It manages the installation and removal of software applications, ensuring compatibility and preventing conflicts within the operating system.

(E) The scheduler is responsible for handling network protocols and communication, facilitating data exchange between connected devices.

Ans: (B)

24. Consider the following Python code. What is the content of the stack after the program execution?

```
stack = [5, 8, 1, 2, 9]
x = stack.pop()
stack.append('5')
stack.append(x)
```

(A) [8, 1, 2, 9, '5' ,5]
(B) [8, 1, 2, 9, 5, '5']
(C) [5, 8, 1, 2, 5, 9]
(D) [5, 8, 1, 2, '5', 9]
(E) Syntax Error.
Ans: (D)

25. Which one of the following statements about TCP/IP networks is NOT correct?

(A) Each host is assigned a unique IP address.
(B) IPv4 addresses consist of 32 bits.
(C) A class C network has 256 useable addresses which can be assigned to host machines.
(D) A broadcast IP is the last IP address of the subnet.
(E) Each address consists of two parts: network address and host address.
Ans: (C)

26. Given the following program in C++. Which statement is correct?

```
#include <iostream>
using namespace std;
int count = 0;
int binarySearch(int a[], int l, int r, int x){
    while (l <= r){
        count++;
        int mid = l + (r - l) / 2;
        if (a[mid] == x) return mid;
        if (a[mid] < x) l = mid + 1;
        else r = mid - 1;
    }
    return -1;
}
int main(){
    int a[10] = {2, 5, 8, 12, 16, 23, 38, 56, 72, 91};
    int target = 23;
    int result = binarySearch(a, 0, 9, target);
    cout << count;
    return 0;
}
```

(A) The value of variable *count* is 2 at the end of the program's execution.

(B) During the first execution of *binarySearch()*, the variable *mid* is 5.
(C) During the first execution of *binarySearch()*, the search should proceed to the left side.
(D) The time complexity is O(n).
(E) None of the above.
Ans: (E)

27. Which one of the following statements is correct?
(A) All peripheral devices need a device driver to communicate with the operating system.
(B) The I/O functions, such as scanf() and printf() in C, eventually invoke system calls to perform I/O.
(C) All I/O instructions are privileged instructions.
(D) (A) and (C).
(E) All of the above.
Ans: (E)

28. Cloud computing has been adopted in businesses, and service providers provide different types of cloud services. Which one of the following statements is NOT correct?
(A) Virtual machine is an enabling technology of cloud computing.
(B) Hypervisors offer resource management for users to monitor the usage of computing resources.
(C) SaaS is one type of cloud computing.
(D) A container is a software package that includes an executable with its dependencies.
(E) A virtual machine is an abstraction of a pure software system.
Ans: (E)

29. Consider the following code in C. If the input sequence is 0, 3, 1, -1. What is the output of the final position and its value?

```
int main()
{
    int board[3][3] = {{1,2,3}, {4,5,6}, {7,8,9}};
    int control, x = 1, y = 1;
    while(1){
        scanf("%d", &control);
        if(control < 0 || control > 3) break;
        switch(control){
            case 0: y--; break;
            case 1: y++; break;
            case 2: x--; break;
            case 3: x++; break;
        }
    }
    printf("position=[%d][%d], ", y, x);
    printf("value=%d", board[y][x]);
    return 0;
}
```

(A) position=[2][2], value=9
(B) position=[1][1], value=5
(C) position=[2][1], value=8
(D) position=[1][2], value=6
(E) position=[1][0], value=4
Ans: (D)

30. Suppose that *floating-point* instructions are improved with a speedup of tenfold, i.e., speedup = 10. Only 20% of actual instructions are *floating-point* instructions. What is the overall speedup?
(A) 1.22
(B) 5
(C) 1.67
(D) 3
(E) 2
Ans: (A)

31. Which one of the following is correct memory hierarchy?
(A) Register → cache → DRAM → hard drive
(B) Cache → register → DRAM → hard drive
(C) DRAM → cache → register → hard drive
(D) Register → DRAM → cache → hard drive
(E) Cache → DRAM → register → hard drive
Ans: (A)

32. Which one of the following statements about DDoS (distributed denial of service) attacks is NOT correct?
(A) DDoS is a type of attacks that compromise availability.
(B) Syn flooding is a DDoS attack.
(C) DDoS attacks attempt to exhaust the victim's computing resources.
(D) Attackers can use DDoS attacks to steal user data.
(E) DNS amplification is a DDoS attack
Ans: (D)

33. Which one of the following statements about cryptographic hash functions is correct?
(A) Hash provides message confidentiality.
(B) Hash is many-to-one function, so collision may happen.
(C) Hash can be used as a message authentication code.
(D) Hash can protect software integrity.
(E) (B), (C), and (D).
Ans: (E)

34. What is the output of the following C code?

```
#include <stdio.h>

int main()
{
    int a[8] = {6, 7, 7, 9, 8, 1, 3, 2};
    int b[8] = {1, 1, 1, 1, 1, 1, 1, 1};
    for (int i = 0; i < 8; i++) {
        b[a[i]-1] = b[a[i]-1] + 1;
    }
    printf("%d",b[6]);

    return 0;
}
```

(A) 2
(B) 3
(C) 8
(D) 4
(E) 5
Ans: (B)

35. Which of the following arithmetic is NOT allowed on pointers?
(A) Increment/Decrement of a pointer
(B) Addition of integer to a pointer
(C) Subtraction of integer to a pointer
(D) Subtracting two pointers of the same types
(E) None of the above
Ans: (E)

36. Let the height of a tree be the number of nodes, including root node, along the longest path from the root node to the leaf nodes. Consider the integers 42, 37, 12, 58, 31, 74, 86, 98, 66, 11 in a specified order to construct a binary search tree. Which of the following statement is TRUE?
(A) The height of the tree is 4.
(B) The root node is 58.
(C) The node for 31 is a leaf node.
(D) The node for 66 is an internal node.
(E) The node for 86 is a child node of the node for 98.
Ans: (C)

37. What kind of method is NOT for the authentication of a user ID?
(A) CAPTCHA
(B) SMS OTP
(C) Password
(D) Biometrics
(E) All of the above
Ans: (A)

38. A hospital wants to establish a data center for storing all electronic medical records (EMRs). It is required to guarantee the confidentiality of the EMRs to prevent from unauthorized access. Which one of the following algorithms is more suitable to be used to guarantee the confidentiality of EMRs?
(A) AES
(B) RSA
(C) DSA
(D) HTTPS
(E) None of the above
Ans: (A)

39. The following code in C program
char str[] = "NSYSU";
is equivalent to which of the following option?
(A) char str[] = {'N', 'S', 'Y', 'S', 'U'};
(B) char str[5] = {'N', 'S', 'Y', 'S', 'U', '\0'};
(C) char str = {'N', 'S', 'Y', 'S', 'U'};

(D) character str[] = {'N', 'S', 'Y', 'S', 'U', '\0'};
(E) char str[] = {'N', 'S', 'Y', 'S', 'U', '\0'};
Ans: (E)

40. In Python statement, which of the following is error ?
(A) print(23 + "67")
(B) print(23 + int("67"))
(C) print(str(23) + "67")
(D) print(str(23) + str("67"))
(E) None of the above
Ans: (A)

41. Which of the following represents a disadvantage of using a Star topology in networking?
(A) Limited scalability
(B) Single point of failure
(C) Complex wiring requirements
(D) High setup cost
(E) Difficult to troubleshoot
Ans: (B)

42. Which of the following technique can NOT avoid overfitting problem?
(A) Increasing layers / number of units per layer of the neural networks
(B) Using Lasso / Ridge regularization
(C) Early stopping while training model
(D) Adding dropout between layers
(E) Cross-validation
Ans: (A)

43. Which of the following items is NOT features of Dynamic Loading?
(A) The program is loaded in the memory when it's needed during the execution.
(B) It reduces memory usage and improves performance.
(C) Program is not linked and compiled before being loaded in memory.
(D) The complete program is loaded into the main memory before it is executed.
(E) None of the above.
Ans: (D)

44. Which of the following information are normally NOT included in a process control block (PCB)?
(A) CPU-scheduling information
(B) I/O device queues
(C) Memory-management information
(D) Process identifier
(E) All of the above are normally included in a PCB
Ans: (E)

45. Given the following piece of code, which one of the following statements is correct?

```
#include <stdio.h>
#include <string.h>

int Func(char* s1, char* s2)
{
    int M = strlen(s1);
    int N = strlen(s2);
    int I, j;

    for (i = 0; i <= N - M; i++) {
       for (j = 0; j < M; j++)
            if (s2[i + j] != s1[j])
                break;
        if (j == M)
            return i;
    }
     return -1;
}
```

(A) This code is to check if string s1 is a substring of s2.
(B) It returns -1 when string s1 does not exist in string s2.
(C) It returns the position of string s2 that contains s1 if s1 is in s2.
(D) The time complexity is O(MN).
(E) All of the above.
Ans: (E)

46. In the following statements which is NOT true regarding Bob wants to send Alice an encrypted email?
(A) Bob and Alice each can have his/her own pair of public and private keys.
(B) Bob can take Alice's public key and encrypt his message to her.
(C) Bob can take his public key and encrypt his message to her.
(D) Bob can take his private key to encrypt his message to her.
(E) Bob has more than one way to encrypt his message.
Ans: (C)

47. Which of the following statements about arrays and linked lists is correct?
(A) Linked lists have dynamic memory allocation.
(B) Arrays have a fixed size determined at compile time.
(C) Linked lists have efficient insertion and deletion operations.
(D) Both arrays and linked lists can be used to implement data structures.
(E) All of the above.
Ans: (E)

48. Which one of the following security features is required to prevent medical internet-of-things (MIoT) devices from being out-of-service?
(A) Confidentiality
(B) Integrity
(C) Authentication
(D) Availability
(E) Multi-factor authentication
Ans: (D)

49. Given the following piece of code, which one of the following statements is NOT correct?

```
#include <stdio.h>

int main() {
    int n1, n2, max;

    scanf("%d %d", &n1, &n2);
    max = (n1 > n2) ? n1 : n2;
    while (1) {
        if ((max % n1 == 0) && (max % n2 == 0)) {
            printf("The result is %d\n", max);
            break;
        }
        ++max;
    }
    return 0;
}
```

(A) This program takes two integers as input and calculates the least common multiplier (LCM) of the two integers.
(B) The variable max is used to store the LCM of the two input integers.
(C) Given n1=4 and n2=3, the while loop iterates 9 times to find the answer.
(D) The initial value of the variable max is the maximum of the two input integers.
(E) The time complexity is O(max(n1, n2)).
Ans: (E)

50. What is the output of the following C program code?

```
#include <iostream>
int &max(int &i, int &j) {
    if (i < j) return j;
    return i;
}

int main()
{
    int a = 78, b = 43;
    max(a,b) = 10;
    max(a,b)++;
    std::cout<<a<<", "<<b;

    return 0;
}
```

(A) 10, 44
(B) 78, 43
(C) 44, 10
(D) 79, 10
(E) 10, 44
Ans: (A)