

114學年度 學士後醫學系招生考試

計算機概論與程式設計試題封面

考試開始鈴響前，請勿翻閱本試題！

★考試開始鈴響前，請注意：

- 一、除准考證、應考文具及一般手錶外；行動電話、穿戴式裝置及其他物品均須放在臨時置物區。
- 二、請務必確認行動電話已取出電池或關機，行動電話及手錶的鬧鈴功能必須關閉。
- 三、就座後，不可擅自離開座位或與其他考生交談。
- 四、坐定後，雙手離開桌面，確認座位號碼、答案卡號碼與准考證號碼相同，以及抽屜中、桌椅下或座位旁均無非考試必需用品。如有任何問題，請立即舉手反應。
- 五、考試開始鈴響前，不得翻閱試題本或作答。
- 六、考試全程不得吃東西、喝水及嚼食口香糖。
- 七、違反上述規定，依「筆試規則及違規處理辦法」議處。

★作答說明：

- 一、考試時間：100 分鐘。
- 二、本試題(含封面)共 10 頁，如有缺頁或毀損，應立即舉手請監試人員補發。
- 三、本試題單選題共 30 題、申論題 4 題，共計 100 分；每題單選題答錯倒扣，不作答不計分。
- 四、單選題答題依題號順序劃記在答案卡上，寫在試題本上無效；答案卡限用 2B 鉛筆劃記，若未按規定劃記，致電腦無法讀取者，考生自行負責。
- 五、申論題部分以「答案卷」作答，作答時不得使用鉛筆，違者該科答案卷不予計分；限用黑色或藍色墨水的筆書寫。
- 六、試題本必須與答案卡一併繳回，不得攜出試場。

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【單選題】每題 2 分，共計 60 分。答錯 1 題倒扣 0.5 分，倒扣至本大題零分為止，未作答，不給分亦不扣分。

1. A software engineer is optimizing a real-time embedded system. The processor being used follows the RISC architecture. Which of the following optimizations is best suited for this processor?
 - (A) Minimizing pipeline stalls by keeping instruction execution times uniform
 - (B) Using highly optimized microcode for complex instructions
 - (C) Utilizing variable-length instructions to reduce code size
 - (D) Optimizing for micro-op fusion to minimize instruction count
 - (E) Relying on Instruction-Level Parallelism (ILP) to reduce execution cycles

2. Which of the following is the goal of a page replacement algorithm?
 - (A) Decrease disk access time
 - (B) Increase CPU utilization
 - (C) Reduce page faults
 - (D) Reduce the number of processes
 - (E) Increase memory fragmentation

3. Suppose you are using the MNIST dataset to train a neural network model to recognize handwritten digits. Which of the following settings is practical?
 - (A) To accelerate convergence, you can set the learning rate to 256 initially.
 - (B) To make the model more generalized, you can randomly apply image mirroring with a probability of 1/2.
 - (C) To avoid gradient explosion, you can limit the gradient size to 2.
 - (D) To avoid difficulty in training the model, the order of the images should be fixed during training.
 - (E) Since the goal of training is to classify digits from 0 to 9, which is a regression problem, you should set the number of output nodes to 1 and use mean square error as the loss function.

4. In the supervised learning, what is the purpose of a grid search?
 - (A) To shift the decision boundary or regression line.
 - (B) To split the data into training and testing sets.
 - (C) To select the best features for a model.
 - (D) To prevent overfitting.
 - (E) To search for the best combination of hyperparameters for a given model.

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5. A program has a one-dimensional array of integers A. Each element of the array is a four-byte integer. The array is stored in contiguous memory space. If the memory address of A[100] is 2000, then which of the following is the address of A[50]?
- (A) 1000 (B) 1800 (C) 996
(D) 1004 (E) 1200
6. Huffman coding is an efficient method of compressing data without losing information. Symbols that appear more often will be encoded as a shorter bit string, while symbols that are not used much will be encoded with longer strings. If Huffman coding is used to compress a sequence with 5 different codewords, which of the following probability distributions will lead to the **WORST** compression ratio?
- (A) 0.2, 0.2, 0.2, 0.2, 0.2 (B) 0.02, 0.02, 0.03, 0.03, 0.9
(C) 0.1, 0.1, 0.2, 0.3, 0.3 (D) 0.1, 0.2, 0.2, 0.2, 0.3
(E) 0.05, 0.05, 0.2, 0.2, 0.5
7. A Distributed Denial of Service (DDoS) attack attempts to consume the target's resources so that it cannot provide service. What is a DDoS attack and how does it work?
- (A) A type of malware that infects multiple machines and spreads through a network.
(B) A type of cyber attack that targets an individual user's personal information.
(C) A type of attack that attempts to overload a server or network with traffic from multiple sources.
(D) A type of attack that exploits vulnerabilities in software to gain unauthorized access to a system.
(E) A type of attack that intercepts and manipulates data transmitted over a network.
8. Which of the following statements is **CORRECT** about decision trees in data mining?
- (A) Decision trees cannot handle categorical data.
(B) A deeper decision tree always improves model performance.
(C) Decision trees do not support ensemble learning.
(D) A decision tree must always be binary.
(E) Pruning is used to reduce overfitting in decision trees.

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9. As computer systems evolve, greater performance can be achieved by taking advantage of improvements in technology, such as faster circuitry. Which of the following is a method used in computer organization to increase the performance of a CPU by allowing multiple instructions to be executed simultaneously?
- (A) Multithreading
 - (B) Multiprocessing
 - (C) Pipelining
 - (D) Supercomputing
 - (E) Parallel computing
10. Which operating system scheduling algorithm may lead to starvation?
- (A) First-Come, First-Served (FCFS)
 - (B) Shortest Job First (SJF)
 - (C) Round Robin
 - (D) Multilevel Queue
 - (E) First-In, First-Out (FIFO)
11. Which of the following statements about machine learning is **CORRECT**?
- (A) We can generate new features by linearly or non-linearly combining the original features, which is a method of feature engineering.
 - (B) In a dataset, all pairwise combinations of data point vectors are called the support vectors of the dataset.
 - (C) During the training process of a neural network, the validation loss typically fluctuates, but the training loss will always decrease.
 - (D) In k-NN classification, k should be set equal to the size of the dataset so that the entire dataset is considered before making a decision.
 - (E) When training a deep learning model, if the accuracy of the test set is higher than that of the training set, it should be considered evidence of overfitting.
12. Which of the following statements about TCP technology in the internet is **CORRECT**?
- (A) It uses a two-way handshake to establish a connection.
 - (B) It has flow control functionality.
 - (C) Packet size is usually smaller than UDP.
 - (D) It is commonly used in video streaming applications.
 - (E) Its full name is Traffic Complicated Protocol.

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13. Which of the following designs is a data structure to implement a Least Recently Used (LRU) cache, supporting get and put operations in $O(1)$ time complexity?
- (A) Stacks (B) Doubly linked list
(C) Hash table (D) Hash table + Doubly linked list
(E) Stacks + Doubly linked list
14. Hamming distance is a metric used in computer science to measure dissimilarity between two binary data strings. Which of the following binary strings has a Hamming distance of 5 with $(11010011)_2$?
- (A) $(11011111)_2$ (B) $(00010000)_2$
(C) $(11111111)_2$ (D) $(01111110)_2$
(E) $(10010111)_2$
15. Which of the following statements is **CORRECT**?
- (A) DBSCAN is an algorithm for scanning database information and building indexes.
(B) Naïve Bayes Classifier assumes all features are independent of each other, making it suitable for any dataset.
(C) The first projection direction of PCA is the direction that maximizes the separation between different data classes.
(D) K-means refers to a method of classifying data by using a linear combination of K weak classifiers.
(E) Sequential forward selection is a feature selection method where, at each step, the feature that improves classification performance the most is chosen.
16. In dimensionality reduction, what is the main goal of Principal Component Analysis (PCA)?
- (A) To increase the number of features in the dataset.
(B) To remove outliers from the dataset.
(C) To improve accuracy by adding new synthetic features.
(D) To transform correlated variables into uncorrelated ones while preserving variance.
(E) To cluster similar data points together.

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17. A banking system allows users to transfer money between accounts. The system must maintain atomicity and isolation. Consider the following transaction steps:

- (1) Check if Account A has enough balance
- (2) Deduct the amount from Account A
- (3) Add the amount to Account B
- (4) Commit the transaction

Which of the following database properties is most critical to prevent a scenario where money is deducted from Account A but not added to Account B due to a system crash?

- (A) Durability
- (B) Isolation
- (C) Atomicity
- (D) Consistency
- (E) Concurrency

18. Which of the following statements about memory management in operating systems is **CORRECT**?

- (A) Page size is usually set to a power of 2, such as 20 or 40.
- (B) The page table is usually stored on the hard disk.
- (C) When performing page replacement, the page that is used most frequently is typically selected for removal from the memory.
- (D) If a process performs I/O, the memory page associated with it should be chosen for removal from the memory.
- (E) A page fault means that the data a process tries to access via a virtual address have not been loaded into physical memory.

19. Which of the following is a **CORRECT** order for the Convolutional Neural Network (CNN) operation?

- (A) convolution $\rightarrow$ max pooling $\rightarrow$ flattening $\rightarrow$ full connection
- (B) max pooling $\rightarrow$ convolution $\rightarrow$ flattening $\rightarrow$ full connection
- (C) flattening $\rightarrow$ max pooling $\rightarrow$ convolution $\rightarrow$ full connection
- (D) full connection $\rightarrow$ max pooling $\rightarrow$ convolution $\rightarrow$ flattening
- (E) max pooling $\rightarrow$ full connection $\rightarrow$ convolution $\rightarrow$ flattening

20. Let A and B be Boolean values. Which of the following is equivalent to $\text{NAND}(\text{NAND}(A, \text{NAND}(A, B)), \text{NAND}(B, \text{NAND}(A, B)))$?

- (A) NOT(B)
- (B) NOR(A, B)
- (C) AND(A, B)
- (D) XOR(A, B)
- (E) NAND(A, B)

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21. Consider the following binary search program written in Python. Please select the **CORRECT** statement when the input array `arr` contains exactly 10 numbers.

```
def binary_search(arr, key):  
    low, high = 0, len(arr) - 1  
    while low <= high:  
        center = (low + high) // 2  
        if arr[center] == key:  
            return center  
        elif key < arr[center]:  
            high = center - 1  
        else:  
            low = center + 1  
    return -1
```

- (A) When all the numbers in `arr` are the same, it will return 0.
- (B) When the key is greater than `max(arr)`, it will return 10.
- (C) When the key is greater than `max(arr)`, it will return 11.
- (D) It is applicable to a monotonically increasing sequence.
- (E) If you forget to sort `arr` first, it will return -1 regardless of the key.

22. When designing a website that allows users to upload and download images, which of the following methods is currently considered the safest when used individually?

- (A) Prohibit users from uploading files if the file name ends with common code extensions like `.asp` or `.php`.
- (B) Allow users to upload files if the file's MIME type is `'image/jpeg'` or other common image MIME types.
- (C) Allow users to upload files if the file content includes common image headers like `jpg` or `png`.
- (D) Limit the file size to a reasonable range for typical image files.
- (E) Use a trusted library to reprocess the image, remove EXIF and other metadata, and store it in a directory that does not execute code.

23. Digital audio is a representation of sound that can be stored, processed, and played back on a computer. For a single channel (mono) audio recording 10 seconds long, with a sample rate of 44.1 kHz and a bit depth of 16 bits, what is the size of the uncompressed audio file?

- (A) 882 kbytes (B) 7056 kbytes (C) 14112 bytes
- (D) 7056 bytes (E) 882 kbits

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24. A company's database contains a table Sales with millions of rows, and the following SQL query is executed frequently:

```
SELECT ProductID, SUM(SalesAmount)
FROM Sales
WHERE Region = 'North'
GROUP BY ProductID;
```

Which of the following optimizations would most effectively improve the query performance?

- (A) Adding an index on SalesAmount
- (B) Creating a composite index on (Region, ProductID)
- (C) Partitioning the table by ProductID
- (D) Using HAVING SUM(SalesAmount) > 0 to filter results
- (E) Adding an index on ProductID only

25. Take four Host IDs from the 192.168.10.0/24 subnet for segmentation. How can seq1 and seq16 be best described?

Seq	Subnet ID	IP Range		Broadcast
1	192.168.10.0/28	192.168.10.1	192.168.10.15	192.168.10.16
...	...	...	...	...
16	192.168.10.240/28	192.168.10.241	192.168.10.255	192.168.10.255

- (A) Seq 1 has only a broadcast address issue.
- (B) Seq 16 has only a broadcast address issue.
- (C) Both Seq1 and Seq16 have issues with the broadcast address.
- (D) Both Seq1 and Seq16 have issues with the IP range.
- (E) Both Seq1 and Seq16 have no issues.

26. What is the primary purpose of time slicing in a multitasking system?

- (A) Reduce memory usage
- (B) Increase CPU utilization
- (C) Minimize CPU switching cost
- (D) Maximize execution time of a single process
- (E) Limit the number of concurrent processes

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27. A deep learning-based image classification model performs extremely well on training data but performs poorly on unseen test images. Which of the following is the most effective approach to mitigate this issue?
- (A) Increase the depth of the neural network to capture more complex patterns in training data
 - (B) Use dropout regularization to randomly deactivate neurons during training
 - (C) Train the model longer until the test accuracy starts improving
 - (D) Use a smaller training dataset to reduce overfitting
 - (E) Reduce the number of training epochs to prevent the model from converging completely
28. What are the **CORRECT** intermediate steps of the data set 25,30,20,28 when it is being sorted with the Insertion Sort?
- (A) 25,20,30,28 → 25,20,28,30 → 20,25,28,30
 - (B) 20,30,25,28 → 20,25,30,28 → 20,25,28,30
 - (C) 20,30,25,28 → 20,28,25,30 → 20,25,28,30
 - (D) 25,28,20,30 → 20,28,25,30 → 20,25,28,30
 - (E) 25,30,20,28 → 20,25,30,28 → 20,25,28,30
29. Public key cryptography is a method of secure communication that uses a pair of keys, a public key and a private key. This system ensures that only the intended recipient can read an encrypted message and that a signed message truly comes from the claimed sender. Which of the statement below regarding data encryption using public key algorithms is **CORRECT**?
- (A) The sender encrypts with the public key and the receiver decrypts with the public key.
 - (B) The sender encrypts with the private key and the receiver decrypts with the private key.
 - (C) The sender encrypts with the public key and the receiver decrypts with the private key.
 - (D) The sender encrypts with the private key and the receiver decrypts with the public key.
 - (E) The sender decrypts with the private key and the receiver encrypts with the public key.
30. Cache memory consists of a small, fast memory that acts as a buffer for the DRAM. What is cache memory and how does it work?
- (A) Cache memory is a type of volatile memory that stores frequently used data to reduce the need to access slower storage media.
 - (B) Cache memory is a type of non-volatile memory that stores data permanently.
 - (C) Cache memory is used to store the operating system kernel.
 - (D) Cache memory is slower than main memory.
 - (E) Cache memory is used to store infrequently used data to speed up performance.

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【申論題】每題 10 分，共計 40 分。未作答或作答錯誤，不給分亦不扣分。

1. Given the following program, what are the outputs after code execution?

```
#include <stdio.h>

int f(int a, int b) {
    while (b > 0) {
        printf("a = %d, b = %d\n", a, b);
        int temp = a % b;
        a = b;
        b = temp;
    }
    printf("Final a = %d, b = %d\n", a, b);
    return a;
}

int main() {
    f(120, 33);
    return 0;
}
```

2. What will be the output of the following code?

```
#include <stdio.h>

int x = 4;
void add(int x) {
    x = 5;
    for(; x > 0; x--){
        printf("%d, ", x);
    }
}

int main() {
    printf("%d, ", x);
    add(x);
    printf("%d", x);
    return 0;
}
```

3. In the field of Artificial Intelligence, “overfitting” is a common problem when using machine learning methods for model training. How can overfitting be resolved? (At least five solutions)
4. Let $f(x) = x^2$. Calculate x_1 to x_5 using the gradient descent algorithm with $x_0 = 10$ and learning rate = 0.1.