高雄醫學大學 109 學年度學士後醫學系招生考試試題

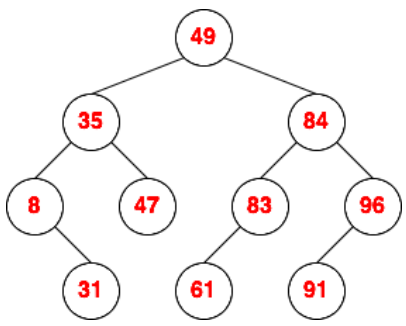
科目：計算機概論與程式設計　　考試時間：100 分鐘

說明：一、選擇題用 2B 鉛筆在「答案卡」上作答，修正時應以橡皮擦擦拭，不得使用修正液(帶)，未遵照正確作答方法而致電腦無法判讀者，考生自行負責。
二、試題及答案卡必須繳回，不得攜出試場。

【單選題】每題 2 分，共 30 題，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 screw factory would like to identify flawed screws by using a machine learning (ML) algorithm. Suppose there are total *P* flawed screws among all the produced screws, but only *n* out of all the flawed screws are reported by the ML algorithm. Which one of the following measurements is used to describe the ratio of identified flawed screws (*n*/*P*)?
   (A) F1-score
   (B) False positives
   (C) Precision
   (D) Recall
   (E) True positives

2. Given the binary tree on the right-hand side. What is the result of post order traversal?
   (A) 8, 31, 35, 47, 61, 83, 84, 91, 96, 49
   (B) 31, 8, 47, 35, 61, 83, 91, 96, 84, 49
   (C) 31, 61, 8, 47, 83, 91, 96, 84, 35, 49
   (D) 8, 31, 35, 47, 49, 61, 83, 84, 91, 96
   (E) 31, 61, 91, 8, 47, 83, 96, 35, 84, 49



3. Which of the following statement is **INCORRECT**?
   (A) In designing a machine learning system, signal processing methods can be a very valuable data pre-processing tool.
   (B) When the training and testing errors of a neuron network is becoming larger and larger, we should terminate the training process to avoid the overfitting problem.
   (C) The key of human intelligence comes from the connection weights between the neuron.
   (D) Generally speaking, one of the difficulties encountered by most of the optimization methods is in finding global minimum.
   (E) Compared to batch learning, the sequential learning method can more accurately estimate the gradient of the error function.

4. The sequence below shows the page number used from left to right. How many times of page fault will occur if the Least Recently Used (LRU) page replacement policy is used and the frame size is 5?
   1 3 6 7 2 4 6 2 5 6 9 1 2 1 4 3 4 5 7 8
   (A) 5 times (B) 6 times (C) 7 times (D) 8 times (E) 9 times

5. Which of the following statement is **INCORRECT**?
   (A) The basic objective of auto-encoder is to reproduce its inputs by using a smaller set of features.
   (B) In generative adversarial network (GAN), the discriminator often has access to both the synthetic and real sample. Its task is to try to differentiate them as accurate as possible.
   (C) Training recurrent neural networks (RNNs) is much easier than training convolution neural networks (CNNs).
   (D) In GAN, the generator has to provide information to the discriminator so that the discriminator can try to do a better job for classifying real and fake samples.
   (E) For CNNs, the convolution is essentially a filtering operation.

6. Suppose a hashed file is constructed using the division hash algorithm of “key-value mod size”. Assume that indices of the hash table are labeled 0⋯6. The sequence of inserting the following key-values into the hash table is 24, 30, 3, 18, 15, 21, 9. To read the keys out from the table following the order of 0⋯6 of the hash table's indices, which of the following might be the possible sequence?
   (A) 24, 30, 3, 18, 15, 21, 9
   (B) 3, 9, 15, 18, 21, 24, 30
   (C) 21, 15, 9, 30, 3, 24, 18
   (D) 3, 9, 18, 21, 30, 24, 15
   (E) 21, 15, 30, 9, 24, 3, 18

7. Elevator disk scheduling algorithm is a method to find the total number of seek operations performed to access all the requested tracks. In the following scenario:
Request sequence = {182, 70, 29, 60, 95, 7, 41, 120}
Initial head position = 50
Direction = left
What is the total number of seek operations if elevator disk scheduling algorithm is used?
(A) 228 (B) 289 (C) 258 (D) 226 (E) 232

8. The technique that allows a computer with small RAM to execute a program of much bigger size is _____.
(A) paging
(B) virtual memory
(C) multi-disk
(D) spooling
(E) none of the above

9. Numerical system conversion. Assume $(654)_r=(333)_{10}$, please find the radix r.
(A) r=5 (B) r=6 (C) r=7 (D) r=8 (E) r=9

10. Which of the following 8-bit pairs, 2's-complement numbers will result in "overflow" when the numbers of the pairs are added?
(A) 00000001, 11111111
(B) 00000001, 10000000
(C) 10000001, 10101010
(D) 00111111, 00111111
(E) 00010001, 10001000

11. The following is a C program code:

```
int foo(int* ptr, int num){
        *ptr = *ptr + num;
        if (num==1)
                return 1;
        else
                return num + foo(ptr, num-1);
}
void main() {
        int a = X;
        int b = foo(&a, a);
        printf("Y=%d, Z=%d", a, b);
}
```

Which one of the following statement is **CORRECT**?
(A) when X=2, then Y is 3, Z is 3.
(B) when X=3, then Y is 9, Z is 3.
(C) when X=4, then Y is 12, Z is 10.
(D) when X=5, then Y is 20, Z is 15.
(E) when X=6, then Y is 27, Z is 20.

12. There are two code sequences for a particular computer, and three classes of instructions (A, B, and C) in the instruction set. The CPI (Cycle Per Instruction) and instruction counts for the instruction class are as follows:

	CPI for this instruction class		
	A	B	C
CPI	3	2	5

Code sequence	Instruction counts for instruction class		
	A	B	C
1	1	1	3
2	1	4	2

What is the CPI for code sequences 1 and 2? [The answer shall be in the order: (code sequence 1, code sequence 2)]
(A) (4, 3) (B) (3, 5) (C) (4, 5)
(D) (5, 4) (E) (5, 3)

13. RSA (Rivest–Shamir–Adleman) is one of public-key cryptosystems and is widely used for secure data transmission. In RSA, if public key (e, N) = (5, 21), private key (d, N) = (5, 21), and ciphertext is 11, what is the corresponding plaintext?
(A) 7 (B) 4 (C) 9 (D) 5 (E) 2

14. The Karnaugh map is a method of simplifying Boolean algebra expressions. Which of the following statements is the most simplified formula of the Boolean function below?

$$X = ABC + A\overline{B}C + \overline{A}B\overline{C} + \overline{A}\,\overline{B}\,\overline{C}\,\overline{D} + AB\overline{C}D$$

(A) $X = ABC + B\overline{C}D + \overline{A}\,\overline{C}\,\overline{D}$

(B) $X = AC + BD + \overline{A}\,\overline{C}\,\overline{D}$

(C) $X = ABC + BC\overline{D} + \overline{A}\,\overline{C}$

(D) $X = ABC+BD$

(E) $X = AC + B\overline{C}D + \overline{A}\,\overline{C}\,\overline{D}$

15. Consider the following set of processes and the length of the CPU-burst time given in milliseconds. The processes are assumed to have arrived in the order P1, P2, P3, P4, all at time 0. What is the average waiting time of these processes using Non-Preemptive Shortest Job First (SJF) scheduling?

Process	Burst time
P1	4
P2	6
P3	5
P4	1

(A) 4 (B) 7 (C) 5 (D) 6 (E) 2

16. If a company has an IP network (192.115.227.128/26) and they want to divide the network into two subnets with 32 addresses in each subnet. What is the net mask of these two subnets?
(Note: To ignore the IP address available or not after subnetting)
(A) 255.255.255.248
(B) 255.255.255.0
(C) 255.255.255.240
(D) 255.255.255.224
(E) 255.255.255.255

17. Refer to Tables 1 and 2 below, please choose the **CORRECT** outputs (A) and (B) resulted from the execution of the following SQL statements:

```
SELECT students.Name, math.Score
FROM students
INNER JOIN math
ON students.S_ID = math.S_ID
```

Output

Name	Score
(A)	(B)
Jerry	95

Table 1. students

S_ID	Name	Phone Number	Gender	Birth
1010001	Jerry	7895846	Male	1999/08/23
1010002	Mary	9584628	Female	1999/03/16
1010003	Sam	6038498	Male	1998/07/01

Table 2. math

No.	Score	S_ID
1	80	1010003
2	55	1010011
3	60	1010005
4	95	1010001
5	73	1010006

(A) Name = Sam, Score = 80
(B) Name = Jerry, Score = 55
(C) Name = Mary, Score = 60
(D) Name = Sam, Score = 73
(E) Name = Mary, Score = 73

18. A sorting algorithm is stable if two objects with equal keys appear in the same order in sorted output as they appear in the input array to be sorted. Among the following five sorting algorithms, which is an "**UNSTABLE**" sorting algorithm?
(A) Bubble Sort (B) Heap Sort (C) Merge Sort (D) Radix Sort (E) Insertion Sort

19. Which one of the following statement is **INCORRECT** about Complete Binary Tree with 1000 nodes filled in with 1 to 1000 from root?
(A) The number 377 is located at level 9.
(B) The height of tree is 10.
(C) In a complete binary tree, if a node doesn't have left children node, it must be a leaf node.
(D) There are a total of 501 leave nodes.
(E) None of the above.

20. Which one of the following statement about shortest path problem is **INCORRECT**?
(A) Dijkstra's algorithm solves the single-source shortest path problem with both non-negative and negative edge weights.
(B) Bellman–Ford algorithm solves the single-source problem with possible negative edge weights.
(C) The shortest path problem is the problem of finding a path between two vertices (or nodes) in a graph such that the sum of the weights of its constituent edges is minimized.
(D) The shortest path problem can be defined for undirected, directed, or mixed graphs.
(E) None of the above.

21. The following python code is applied for the four arrays d1—d4.

```
import numpy as np
def func(x, y):
    c = np.ndarray(x.shape)
    for i in range(len(x)):
        a = x[i]
        b = y[i]
        c[i] = (a or b) and (not(a and b))
    return c
```

d1 = np.array([1, 0, 0, 1, 0, 0]); d2 = np.array([0, 1, 0, 1, 1, 0]); d3 = np.array([0, 0, 0, 0, 0, 0]);
d4 = np.array([1, 1, 0, 0, 1, 0]). Consider the following statements.
(a) func(d1, d2)[2] = 0
(b) func(d2, d4) = d3
(c) func(d1, d2) = d4
(d) func(func(d1, d4), d2) = d3

Which of the above statements is **CORRECT**?
(A) (a)(b)
(B) (a)(c)(d)
(C) (b)(c)(d)
(D) All of the above are correct
(E) None of the above is correct

22. Consider the following C code

```
int main(){
        int arr[] = {203, 151, 164, 154, 194};
        int *p = arr;
        *p++ += 10;
        *(p++) += 11;
        *(++p) += 9;
        for (int i = 0; i < 5; i++)
            printf("%d ", arr[i]);
        return 0;
}
```

What is the output of above program?
(A) 203 151 164 154 194
(B) 213 151 175 154 203
(C) 203 162 175 163 194
(D) 213 162 164 163 194
(E) Segmentation Fault

23. A security attack that makes users unable to access a service is called_____.
(A) DoD
(B) DoS
(C) zombie
(D) DnS
(E) DDS

24. A binary tree can be described as a one dimensional array which level-wise retains all nodes from the root. Consider the following 1-D array as a binary tree and the following statements.

i	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
A[i]	K	A	O	H	S	I					U	N	G		

(a) If the root is at level 0, the height of the binary tree is 3

(b) The left-child of A[i] is A[2i-1]

(c) Post-order traversal of the tree (left-node first): H,U,S,A,N,G,I,O,K

(d) In-order traversal of the tree (left-node first): H,A,S,U,K,N,I,G,O

(e) The average search complex of such binary trees is O(n)

Which of the above statements is **CORRECT**?
(A) (a)(b)(d)
(B) (b)(c)(d)
(C) (a)(c)(d)
(D) (a)(c)(e)
(E) (a)(b)(c)(d)(e)

25. Consider the following C code and the statements (A)~(E).

```
int myfunc(int n){
    if ((n == 0) || (n == 1))
        return 1;
    else
        return myfunc(n-1) + myfunc(n-2);
}
```

(a) myfunc(1)=1

(b) myfunc(3)=3

(c) myfunc(-1)=0

(d) myfunc(5)=8

(e) myfunc(8)=55

Which of the above statements is **CORRECT**?
(A) (a)(b)(c)(d)(e)
(B) (a)(b)(d)(e)
(C) (b)(d)(e)
(D) (a)(b)(d)
(E) (b)(c)(d)(e)

26. According to the following routing table, where will the router send a packet destined for 10.1.5.65?

Network	Interface	Next-hop
10.1.1.0/24	e0	Directly connected
10.1.2.0/24	e1	Directly connected
10.1.3.0/25	s0	Directly connected
10.1.4.0/24	s1	Directly connected
10.1.5.0/24	e0	10.1.1.2
10.1.5.64/28	e1	10.1.2.2
10.1.5.64/29	s0	10.1.3.3
10.1.5.64/27	s1	10.1.4.4

(A) Directly connected
(B) 10.1.1.2
(C) 10.1.2.2
(D) 10.1.3.3
(E) 10.1.4.4

27. Which of the following statement is **INCORRECT**?
    (A) NAT (Network Address Translation) allows multiple hosts to share an external IP simultaneously
    (B) DHCP allows multiple devices to share multiple IPs dynamically
    (C) NAT provides a type of firewall
    (D) DHCP also provides a type of firewall
    (E) All of the above are correct

28. Which of the following can be used in both error detections and error corrections in digital communications?
    (A) Hamming codes
    (B) Parity check
    (C) Checksum
    (D) Cyclic redundancy check
    (E) Manchester code

29. What is the postfix of the expression A + B * C / (D - E)?
    (A) A B C * D E - / +
    (B) A B C D E - / * +
    (C) A * B C / D E - +
    (D) + A / * B C - D E
    (E) + /A * B C - D E

30. The gradient descent has been run for 15 iterations with learning rate **a**=0.3 and the corresponding loss function **J** (theta) is computed after each iteration. You find that the value of **J** (Theta) decreases quickly and then levels off. Based on this observation, which one of the following conclusion seems most plausible?
    (A) Rather than using the current value of **a**, use a larger value of **a** (say **a**=1.0)
    (B) Rather than using the current value of **a**, use a smaller value of **a** (say **a**=0.1)
    (C) **a**=0.3 is an effective choice of learning rate
    (D) Overfitting. Rather than using the current definition of **J**, a better loss function of **J** shall be chosen.
    (E) None of the above

【申論題】每題 10 分，共 4 題，未作答，不給分亦不扣分。

1. Given integers *m*, *n*, and an integer array *arr*[*m*][*n*] filled with non-negative integers, use *dynamic programming* technique to implement a program to find a path from top-left to bottom-right which minimizes the sum of all numbers along the path. You can only move down or right at any point. Your program only needs to output the sum. A sample test case input is given below. Implement your program in C, C++, Java, or Python.

Sample Input:

```
m = 3; n = 4; arr = [
        [ 4, 9, 0, 8 ],
        [ 1, 1, 0, 7 ],
        [ 8, 7, 0, 4 ]
];
```

Sample Output:

10

Note: The sample solution walks from the top-left in the order： $4 \rightarrow 1 \rightarrow 1 \rightarrow 0 \rightarrow 0 \rightarrow 4$

2. The data of Table 1 are taken from a study investigating the use of a deep learning method as a diagnostic tool for detecting lung cancer. It is known that the sensitivity and specificity of this method are approximately 0.628 and 0.823, respectively.

   (a) Determine the value of FN and FP in Table 1. (4pt)

   (b) If a person receive a negative test result, what is the probability that he is healthy? (3pt)

   (c) Determine the prevalence of lung cancer based on the result given in Table 1. (3pt)

Table 1		Disease		
		Present	Absent	Total
Test Results	Positive	302	FP	
	Negative	FN	372	
	Total			

3. “Overfitting” is a typical problem in statistics and machine learning.

   (a) Please explain overfitting. (4pt)

   (b) Which of the following images belongs to overfitting? (2pt)

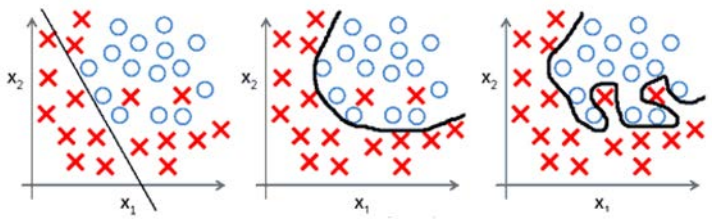


Fig.1 Fig.2 Fig.3

   (c) How to avoid this phenomenon? (4pt)

4. Please explain “TCP three-way handshake process” with diagram.