科目 計算機概論 類組別 A4 共 8 頁 第 1 頁

單選題，共 25 題，每題 4 分(答錯不倒扣)

1. Which phase is not involved in the functioning of an interpreter?
   (A) Parsing
   (B) Lexical analysis
   (C) Syntax analysis
   (D) Preprocessing
   (E) Execution

2. Which of the following statements is true about the `volatile` keyword in C?
   (A) It is the same as the const keyword.
   (B) It guarantees atomicity of variable access.
   (C) It is used to optimize variable access.
   (D) It prevents the compiler from optimizing the variable.
   (E) It ensures the variable is thread-safe.

3. Which of the following descriptions about C language is TRUE?
   (A) When reading **EOF**, **scanf** and **getchar** returns **NULL**, while **gets** and **fgets** return **EOF**.
   (B) **int n** have different memory size on different machine, and so does **int *pn**.
   (C) A loop **for(;;);** is dangerous and will make the program crash within a few minutes.
   (D) **sizeof(int*)** and **sizeof(float****)** have the different size.
   (E) **while(T--) {...}** can be used to repeat a piece of code for exactly **T-1** times.

4. What will be the result of the following C code?

```
#include <stdio.h>
void func() {
    static int x = 0;
    x++;
    printf("%d ", x);
}
int main() {
    for (int i = 0; i < 3; i++) {
        func();
    }
    return 0;
}
```

   (A) 0 0 0
   (B) 1 1 1
   (C) 0 1 2
   (D) 1 2 3
   (E) 2 2 2

注意:背面有試題

5. Which type of data structure is a ternary heap?
   (A) Array
   (B) Hash
   (C) Priority Stack
   (D) Priority Queue
   (E) None of the above

6. Which design pattern defines an interface for creating an object but lets subclasses alter the type of objects that will be created?
   (A) Factory Method
   (B) Abstract Factory
   (C) Builder
   (D) Prototype
   (E) Adapter

7. What is **not** the necessary condition for deadlock?
   (A) Resource holding
   (B) Mutual exclusion
   (C) Circular waiting
   (D) No preemption
   (E) Starvation

8. Which search method takes less memory?
   (A) Depth-First search
   (B) Breadth-First search
   (C) Linear search
   (D) Optimal search
   (E) Random search

9. Which of the following best describes a DDoS attack?
   (A) An attack that involves redirecting traffic to a malicious website.
   (B) An attack that uses multiple compromised systems to flood the bandwidth or resources.
   (C) An attack that intercepts and alters communications between two parties.
   (D) An attack that exploits a specific software vulnerability.
   (E) An attack that installs malware on a single user's computer.

10. Which of the following is a challenge commonly associated with implementing meta-reasoning systems in AI?
(A) Difficulty in defining accurate meta-level objectives.
(B) Lack of sufficient training data.
(C) Inability to process unstructured data.
(D) Poor integration with machine learning models.
(E) Slow processing speeds in general.

11. What is the time complexity of the following recursive function?

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

(A) O(n)
(B) $O(n^2)$
(C) $O(2^n)$
(D) O(n log n)
(E) O(log n)

12. Which shading technique computes the color at each vertex and interpolates the color across the surface of the polygon?
(A) Ray Tracing
(B) Flat Shading
(C) Gouraud Shading
(D) Phong Shading
(E) None of the above

13. Assuming P != NP, which of the following is TRUE?
(A) NP-complete = NP.
(B) NP-complete ∩ P = ∅.
(C) NP-hard = NP.
(D) P = NP-complete.
(E) NP-complete ∩ NP = ∅.

14. Let W(n) and A(n) denote the worst- and average-case running time of an algorithm executed on an input of size n, respectively. Which of the following is TRUE?
(A) W(n) = O (A(n)).
(B) A(n) = O (W(n)).
(C) A(n) = Θ (W(n)).
(D) A(n) = Ω (W(n)).
(E) W(n) = Θ (A(n)).

15. Which of the following statements about signed and unsigned numbers is TRUE?
(A) Even though they have the same width, the two types can represent different ranges of values.
(B) When designing a subtraction function in hardware, it is always necessary to create a separate module instead of using the addition module.
(C) Accesses to signed numbers are slower than accesses to unsigned numbers.
(D) When turning a 2's-complement signed number with a certain number of bits into one with more bits, a sign-extension operation is performed on that number's least significant bit (LSB).
(E) Only C language has unsigned numbers.

16. After executing the following code, which variable is equal to 0?

```
unsigned int a = 0xffffffff;
unsigned int b = 1;
unsigned int c = a + b;
unsigned long d = (unsigned long) a + b;
```

(Assume ints are 32 bits wide and longs are 64 bits wide.)
(A) a
(B) b
(C) c
(D) d
(E) None of the above

17. Memory systems have many bottlenecks. To overcome the bottlenecks of memory systems, i.e., the transmission speed and bandwidth, which of the following techniques cannot be used by a system architect?
(A) Out-of-order execution.
(B) Pre-fetching.
(C) Pipelining.
(D) Caching
(E) Improving data locality.

18. What is the output of the following program?

```
int fun(int i) {
if(i == 0) {
return 0;
 }
 if(i == 1) {
  return 1;
 }
 return fun(i-1) + fun(i-2);
}
```

注意:背面有試題

```
int main() {
    int i;
    for (i = 0; i < 5; i = i +1) {
     printf("%d ", fun(i));
    }
    return 0;
}
```

(A) 0 1 1 1 1
(B) 0 1 2 3 4
(C) 0 1 1 2 3
(D) 0 1 1 2 2
(E) 0 0 0 0 0

19. What is the output of the following program?

```
int fun(int n){
  if (n == 4)
    return n;
  else return 2*fun(n+1);
}
int main(){
  printf("%d ", fun(2));
  return 0;
}
```

(A) 12
(B) 13
(C) 14
(D) 15
(E) 16

20. What is the output of the following program?

```
  int fun(int n)
  {
    if(n <= 1)
        return 1;
    if(n%2 == 0)
        return fun(n/2);
    return fun(n/2) + fun(n/2+1);
  }
```

注意:背面有試題

```
int main()
{
  printf("%d", fun(11));
  return 0;
}
```

(A) 4
(B) 5
(C) 6
(D) 7
(E) 8

21. What is the possible number of comparisons required to find a value in a list of 20 items using a binary search?
(A) 5
(B) 6
(C) 7
(D) 8
(E) 9

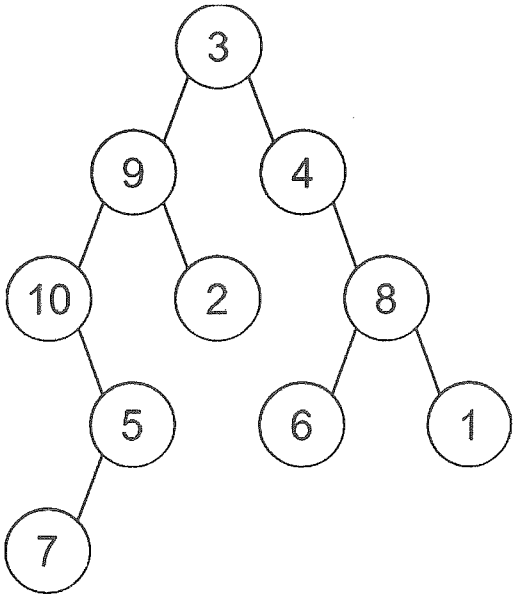
22. Which of the following statements about data structure is TRUE?
(A) A stack is a list in which the entries are removed only at the tail and new entries are inserted only at the head, whereas a queue is a list in which entries are inserted and removed only at the head.
(B) Static structures are easier to manage than dynamic ones.
(C) Standard Template Library (STL) is found in the Java programming environment, and it contains a collection of predefined classes that describe popular data structures.
(D) In binary tree storage techniques, each entry (or node) of the binary tree contains four components: (1) the data, (2) a pointer to the node's first child, (3) a pointer to the node's second child, and (4) a pointer to the node's parent.
(E) In a max heap, for any given node C, if P is a parent node of C, then the key (the value) of P is smaller than or equal to the key of C.

23. Given the following program, which of the following statements is TRUE?

```
int a = 0;
for (int i = 0; i < n; ++i) {
      for (int j = n; j > i; --j) {
          a = a + i + j;
      }
}
```

(A) Time Complexity: O(nlogn).
(B) Time Complexity: O(2n).
(C) Time Complexity: O(n).
(D) Space Complexity: O(1).
(E) Space Complexity: O(n).

24. Which is the pre-order traversal sequence of the following binary tree.



(A) 3 9 4 10 2 8 5 6 1 7
(B) 7 5 10 2 9 6 1 8 4 3
(C) 10 7 5 9 2 3 4 6 8 1
(D) 3 9 10 5 7 2 4 8 6 1
(E) 1 2 3 4 5 6 7 8 9 10

25. What is the output of this program?

```
#include <bits/stdc++.h>
using namespace std;
class base {
public:
  void print1() {
      cout << "base1\n";
  }
};
```

```
class deri1 : public base {
public:
  void print1() {
      cout << "deri1\n";
  }
};

class deri2 : public deri1 {
public:
  void print1() {
      cout << "deri2\n";
  }
};

signed main() {
  base *a = new deri2();
  a -> print1();
return 0;
}
```

(A) base1
(B) deri1
(C) deri2
(D) base1
deri1
(E) base1
deri1
deri2