

國立臺中教育大學九十九學年度研究所碩士班招生考試

計算機導論 試題

適用學系：資訊科學學系

一、單選題 (10%)

1. Which value is different from others?  
(A)  $(-42.375)_{10}$  (B)  $(1010110.101)_2$  in 2's complement  
(C)  $(1010101.101)_2$  in 2's complement (D)  $(1010101.100)_2$  in 1's complement
2. Internet Protocol (IP) belongs to which layer in the OSI model?  
(A) Network Layer (B) Data Link Layer  
(C) Transport Layer (D) Session Layer
3. What is NOT correct about TCP vs. UDP?  
(A) belong to the same layer in the OSI model  
(B) TCP can be used for broadcast transmission  
(C) UDP has no flow control  
(D) TCP is more reliable than UDP
4. Pipelining enhances performance by  
(A) shortening instruction execution time (B) increasing instruction throughput  
(C) increasing the CPI (D) sharing hardware
5. What is NOT correct about compiler?  
(A) the scanner groups individual characters into tokens  
(B) the parser builds the abstract syntax tree (AST) out of tokens  
(C) adding an optimizer can generate more efficient program  
(D) the code generator produces desired machine-independent program

二、多選題 (10%)

1. Which of the following are accurate comparisons between call-by-value and const call-by-reference?  
(A) Both are very fast for all sizes of objects.  
(B) Both protect against changing the caller's argument.  
(C) Both use the same amount of storage for storing the caller's argument.  
(D) Call by values uses less memory than const call-by-reference in making the copy.  
(E) Call-by-value copies the arguments whereas const call-by-reference does not.

<<背面尚有試題>>

2. Give the class declaration in C++, class Foo : public class Bar { /\*...\*/ }; Which of the following is true?
- (A) private members of Bar are inaccessible in Foo.
  - (B) public members of Bar become public members of Foo.
  - (C) private members of Foo become public members of Bar.
  - (D) protected members of Bar become protected members of Foo.
  - (E) private members of Bar become public members of Foo.

### 三、問答題 (80%)

1. How many interger solutions does the inequality  $X_1+X_2+X_3 \leq 18$ ,  $X_1 \geq 3$ ,  $X_2 \geq 6$ ,  $X_3 \geq 2$  have? (10%)
2. Please write down the results labeled (1) to (5) after executing the following program. (10%)

```

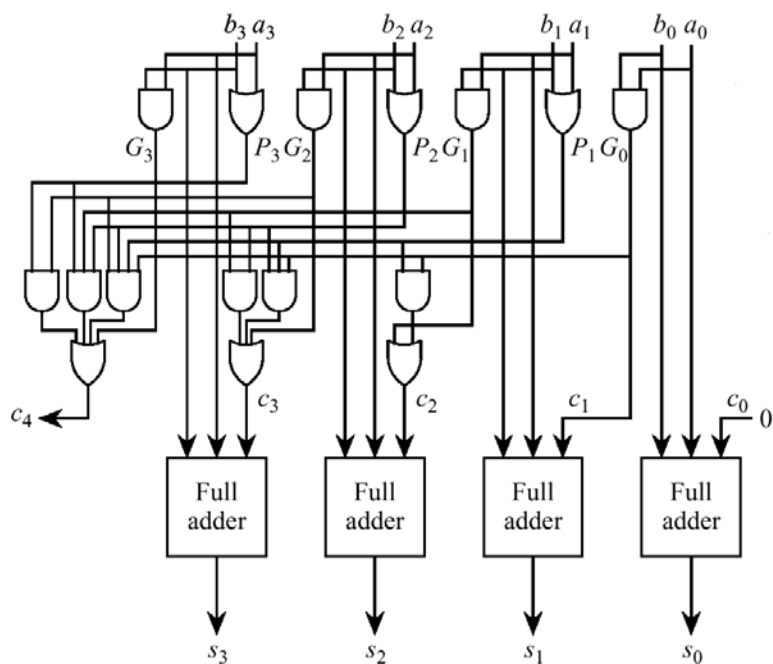
#include<string>
#include<iostream>
using namespace std;
class Move {
protected:
    string nameString;
public:
    Move(string name):nameString(name) {}
    string getName() { return nameString; }
    virtual string move() =0;
};
class Run: public Move{
public:
    Run(string name):Move(name) {}
    string move() { return " is running"; }
};
class Fly: public Move {
public:
    Fly(string name):Move(name) {}
    string getName() { return "<" + nameString + ">"; }
    string move() { return " is flying"; }
};

ostream& operator <<(ostream& os, Move& moveObj) {
    os << "{" + moveObj.getName() + "}" << moveObj.move();
    return os;
}

int main() {
    Run runObject("Avatar");
    Fly flyObject("Borg");
    Move* movePtr = &flyObject;
    Fly* flyPtr = new Fly("Caesar");
    cout << runObject.getName() << runObject.move() << endl; (1)
    cout << movePtr->getName() << movePtr->move() << endl; (2)
    cout << flyPtr->getName() << flyPtr->move() << endl; (3)
    cout << flyObject << endl; (4)
    cout << *flyPtr << endl; (5)
}

```

3. The following is a 4-bit carry-lookahead adder (CLA). (10%)



- (a) Represent  $c_4$  using  $a_i$  and  $b_i$  only. (3%)
- (b) Assume each full adder introduces a gate delay of 2. How many gate delays are required to generate the final result? (2%)
- (c) If we want to construct a 16-bit GCLA using this 4-bit CLA. How many 4-bit CLA is needed? Sketch a diagram to illustrate how to construct. (5%)

4. (10%)

- (a) For a connected graph, explain what are spanning tree and cut-set. (6%)
- (b) Prove the following Theorem: A cut-set and any spanning tree must have at least one edge in common. (4%)

5. Please analyze the average-case time complexity for sequential search in detail. (10%)

6. Please analyze the average-case time complexity for Quicksort in detail. (10%)

7. Please write out the Interpolation Search algorithm and analyze its worst time complexity. (10%)

8. Please explain the following terms: Decision problem, P, NP, NP-Complete, NP-Hard. (10%)

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作業系統 試題

適用學系：資訊科學學系

1. Which of the following instructions are not privileged? Also, please write down your reasons. (A) Read the clock (B) Set value of timer (C) Switch from user mode to monitor mode (D) Clear memory (E) Turn off interrupts (10%)
2. Please address the concepts of the client-server computing. (10%)
3. Please address the concepts of three general methods used to pass parameters to the OS. (10%)
4. Please depict the process state transition diagram. Also, please write down when the short-term scheduler might be invoked. (10%)
5. Please briefly describe the following scheduling algorithms? (10%)
  - (A) First-Come, First-Served Scheduling
  - (B) Shortest-Job-First Scheduling
  - (C) Round-Robin Scheduling
6. A semaphore S is an integer variable that is accessed only through two standard atomic operations: wait() and signal(). (10%)
  - (A) Please describe the definition of wait() and signal().
  - (B) How to use binary semaphores to solve the critical-section problem for multiple processes.
7. What are the necessary conditions of process deadlock? Explain how to prevent deadlock? (10%)
8. Please explain the difference between internal and external fragmentation regarding memory management. (10%)
9. A paging system has the page table stored in memory, and a memory reference takes 200 nanoseconds. A translation look-aside buffer (TLB) is used with the page tables and it takes 20 nanoseconds to search the TLB. If the resultant effective memory access time is 260 nanoseconds, what is the hit ratio of TLB? (10%)
10. A system has a logical address of 1024 pages of 512 words mapped onto a physical memory of 32 frames. Assume each word contains 2 bytes. How many bits are in the logical address and in the physical address? (10%)