111CI02

國立臺北科技大學 111 學年度碩士班招生考試

系所組別：2300 資訊工程系碩士班

第二節　程式設計　試題

注意事項：

1.本試題共 6 題，共 100 分。
2.不必抄題，作答時請將試題題號及答案依照順序寫在答案卷上。
3.全部答案均須在答案卷之答案欄內作答，否則不予計分。

Problem 1 [25%, each 2%, except 1-1-I 3%]

(1) Write the output of the following Python code (1-1-I)~(1-1-III).

```
01  def B(cf, p):
02      print('A:', end='')
03      cf(p)
04  def CF(p):
05      print(p, end='')
06  def A(X):
07      print('B:', end='')
08      B(CF, X)
09      print()
10
11  def M(x):
12      f = lambda s: s[0]*s[1] if s[1]>s[2] else s[0]+s[1]
13      print(f(x))
14
15  def K(perm):
16      if len(perm)<=1:return [perm]
17      r = []
18      for i in range(len(perm)):
19          others = K(perm[:i]+perm[i+1:])
20          for s in others:
21              r = r + [perm[i] + s]
22      return r
23
24  print(K('XYZ'))                          #(Problem 1-1-I)
25  A('C')                                   #(Problem 1-1-II)
26  M([4, 5, 6, 7])                          #(Problem 1-1-III)
```

(2) The output of f(20) is " [2, 3, 5, 7, 11, 13, 17, 19] ". Please complete the following Python code (1-2-I)~(1-2-V).

```
01  def g(N):
02      for i in range(2, N):
03          if _______==0: return False          #Problem 1-2-I
04      return _________                         #Problem 1-2-II
05
06  def f(N):
07      data = [ ____ for i in range(2, N) if _____==True]   #Problem 1-2-III, 1-2-IV
08      return_________                          #Problem 1-2-V
```

(3) The output of h('ABCD') is "['ABCD', 'BACD', 'CABD', 'DABC']". Please complete the following Python code (1-3-I)~(1-3-IV).

```
01  def h(data):
02      result = []
03      length = len(data)
04      for s in range(length):
05          x = data[_______]                    #Problem 1-3-I
06          y = data[0:_____]+data[_________:length]   #Problem 1-3-II, 1-3-III
07          result = result + [ _________]       #Problem 1-3-IV
08      return result
```

Problem	Answer
1-1-I	
1-1-II	
1-1-III	
1-2-I	
1-2-II	
1-2-III	
1-2-IV	
1-2-V	
1-3-I	
1-3-II	
1-3-III	
1-3-IV	

Please copy the above answer table to your answer sheet.

注意：背面尚有試題

Problem 2 [12%, each 2%]

Please trace the following C program and answer the output of each printf() statement for problems 2-1~2-6.

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

int f1(){
    int a=2, b=1;
    unsigned int c=1, d=6;
    return (a&&!b) + (c<<2) + (c|d);
}

float f2(int num) {
    float t = num / 2 * num % 2 + 2 + 1.0 / num;
    return t;
}

int f3(){
    enum direction {North, South, East, West};
    enum direction d = South;
    d=(North+East)/2 > d? East: West;
    return d;
}

int f4(int w[4][3]) {
    for (int i=0; i<4; i++)
        for (int j=0; j<3; j++) {
            if (i>0)
                w[0][j]= w[0][j]+w[i][j];
        }
    return w[0][2];
}
void f5(int x[5], char *s){
    for (int i=0; i<5; i++) {
        switch (x[i]%2 + x[i]%3){
            case 0:   strcat(s, "a");
                      break;
            case 1:   strcat(s, "b");
                      break;
            case 2:   strcat(s, "c");
                      break;
            case 3:   strcat(s, "d");
            default: strcat(s, "e");
                      break;
        }
    }
}
```

```
void f6(int a, int *b, int *c) {
    a = 7; *b = 5; c = &a;
}

int main(int argc, char *argv[]) {
    int w[4][3] = {{4, 2, 1,}, {3, 4, 2}, {2, 3, 3}, {1, 1, 4}};
    int x[5]={5, 4, 3, 2, 1};
    char s[6]="";
    int a=0, b=1, c=6;

    printf("%d\n", f1());              /*   Problem 2-1   */
    printf("%3.1f\n", f2(5));          /*   Problem 2-2   */
    printf("%d\n", f3());              /*   Problem 2-3   */
    printf("%d\n", f4(w));             /*   Problem 2-4   */
    f5(x, s);
    printf("%s\n", s);                 /*   Problem 2-5   */
    f6(a, &b, &c);
    printf("%d %d %d\n", a, b, c);     /*   Problem 2-6   */
    return 0;
}
```

Problem	Answer
2-1	
2-2	
2-3	
2-4	
2-5	
2-6	

Please copy the above answer table to your answer sheet.

Problem 3 [13%] [3-1 ~ 3-6, each 2%] [3-7, 1%]

Suppose that the outputs of the following C program are as follows:

t022	Mary	91.67	90	95	90
t020	Eric	88.33	90	95	80
t003	Apple	85.00	90	85	80
t011	John	78.33	80	85	70

Please trace the program and fill the blanks with correct statements.

```
#include <stdio.h>
#include <stdlib.h>
#define NUM_OF_QUIZ 3

typedef struct student {
      char id[10];
      char name[30];
      float grade;
      int quizs[NUM_OF_QUIZ];
} STUDENT;

float calculate_grade_as_quiz_average(_____ student) {   /* Problem 3-1 */
    int sum=0;
    for(int i = 0; i < NUM_OF_QUIZ; i++) {
          sum=sum+_____;                                  /* Problem 3-2 */
    }
    return (float)sum/NUM_OF_QUIZ;
}

void descending_sort_by_grade(STUDENT* students, int numOfStudents) {
      STUDENT tempStudent;
      int i, j;
      for (i = 0; i < numOfStudents; i++)
         for (j = 0; j < _____; j++)                      /* Problem 3-3 */
            if (students[j].grade < _____) {              /* Problem 3-4 */
                  tempStudent = students[j+1];
                  students[j+1] = students[j];
                  students[j] = tempStudent;
            }
}

int main(void) {
      int numOfStudents;
      STUDENT students[] = {{"t011", "John", 0.0, {80, 85, 70}},
                            {"t020", "Eric", 0.0, {90, 95, 80}},
                            {"t022", "Mary", 0.0, {90, 95, 90}},
                            {"t003", "Apple", 0.0, {90, 85, 80}} };

      numOfStudents = sizeof(_____)/sizeof(students[0]);  /* Problem 3-5 */
      for(int i = 0; i < numOfStudents; i++) {
            students[i].grade=calculate_grade_as_quiz_average(_____);
      }                                                   /* Problem 3-6 */

      descending_sort_by_grade(students, numOfStudents);

      for(int i = 0; i < numOfStudents; i++) {
            printf("%s\t%s\t%.2f", students[i].id, students[i].name, students[i].grade);
            for(int j=0; j < NUM_OF_QUIZ; j++)
                  printf("\t%d", _____);                  /* Problem 3-7 */
            printf("\n");
      }
      return 0;
}
```

Problem	Answer
3-1	
3-2	
3-3	
3-4	
3-5	
3-6	
3-7	

Please copy the above answer table to your answer sheet.

注意：背面尚有試題

Problem 4 [25%] [4-1 ~ 4-7, each 1%] [4-8 ~ 4-13, each 3%]

Please trace the following C++ program and answer problems 4-1 ~ 4-7 with the correct statements and write the std::cout outputs of each statement in problems 4-8 ~ 4-13.

```
#include <iostream>
#include <string>
using namespace std;
class Fruit {
   private:
      string color;
   public:
      void setColor(string value){ color = value; };
      string getColor() const { return color; };
      _____ void taste()_____;    //pure virtual function                    /*Problems 4-1, 4-2*/
      void printInfo() { cout << color << endl; };
      ____void printData() { cout << color << endl; }; //virtual function    /* Problem 4-3 */
};
class Apple: public Fruit {
   private:
      string cultivar;
   public:
      Apple(string co = "red", string cu = "Fuji"): cultivar(cu) { setColor(co); };
      Apple(const Apple __________ a){ //copy constructor                    /* Problem 4-4 */
            setColor(a._________);          //obtain object a's color         /* Problem 4-5 */
            cultivar = a._________;          //obtain object a's cultivar      /* Problem 4-6
*/
      };
      __________Apple(){};              //destructor                          /* Problem 4-7 */
      void taste(){ cout << "sweet" << endl; };
      void setCultivar(string cu){ cultivar = cu; };
      void setCultivar(string cu, string co){ cultivar = cu; setColor(co); };
      void printInfo() { cout << cultivar << endl; };
      void printData() { cout << cultivar << endl; };
};

int main() {
   Apple apple;
   apple.setCultivar("McIntosh", "green");
   Fruit   *p1 = new Apple();
   Fruit   *p2 = new Apple(apple);
   Apple   *p3 = new Apple();
   p3->setColor("yellow");
   p3->setCultivar("McIntosh");
   p1->printInfo();                                                          /* Problem 4-8   */
   p2->printInfo();                                                          /* Problem 4-9   */
   p3->printInfo();                                                          /* Problem 4-10 */
   p1->printData();                                                          /* Problem 4-11 */
   p2->printData();                                                          /* Problem 4-12 */
   p3->printData();                                                          /* Problem 4-13 */
}
```

Problem	Answer
4-1	
4-2	
4-3	
4-4	
4-5	
4-6	
4-7	
4-8	
4-9	
4-10	
4-11	
4-12	
4-13	

Please copy the above answer table to your answer sheet

Problem 5 [19%]

Trace the following C++ program and fill the blanks with correct statements or parameters for 5-2 and 5-8 (1% each), 5-3, 5-5, 5-6, and 5-7 (2% each), and 5-1, 5-4 (3%). Then, write down the outputs for 5-9 (2%) and 5-10 (1%)

```
#include <iostream>
#include <string>
#include <algorithm>
#include <vector>
using namespace std;
_____<class T>                                          /* Problem 5-1 */
string print(T x){
    return x.getName();
}
class Pet {
    _____:                                              /* Problem 5-2 */
    double _weight;
    string _name;
public:
    Pet(double weight, string name) {
        _weight = weight;
        _name = name;
    }
    double getWeight() {
        return _weight;
    }
    virtual string getName() const = 0;
    _____ ~Pet() {                                      /* Problem 5-3 */
    }
};
class Cat : public Pet {
private:
    vector<string> _toy;
    _____ sortedByAlph (string a, string b) {           /* Problem 5-4 */
        return a[0] > b[0];
    }
public:
    Cat(double weight, string name) : _____ {           /* Problem 5-5 */
    }
    ~Cat() override {       }
    void addToy(string toy){
        _toy.push_back(toy);
        sort(_toy.begin(), _toy.begin()+_____, sortedByAlph);   /* Problem 5-6 */
    }
    string getToy(int index) {
        return "cat's toy::" + _toy.at(index);
    }
    string getName() const _____ {                      /* Problem 5-7 */
        return "cat::" + _name;
    }
};
class Bird : public Pet {
private:
    double _canFly;
public:
    Bird(double weight, string name, bool canFly) : _____ {     /* Problem 5-5 */
        _____;                                                  /* Problem 5-8 */
    }
    ~Bird() override {      }
    string getName() const _____{                               / * Problem 5 -7 */
        return "bird::" + _name;
    }
};
int main(){
    Cat diang(8.0, "diang");
    Cat* siang = new Cat (5.0, "siang");
    Bird spar(0.6, "loudly", true);
    diang.addToy("tshirt");
    diang.addToy("ball");
    diang.addToy("human");
    siang->addToy("cockroach");
    siang = &diang;
    cout << print<Cat>(diang) << endl;
    cout << siang->getToy(0) << endl;                           /* Problem 5-9 */
    cout << print<Cat>(*siang) << endl;                         /* Problem 5-10 */
    return 0;
}
```

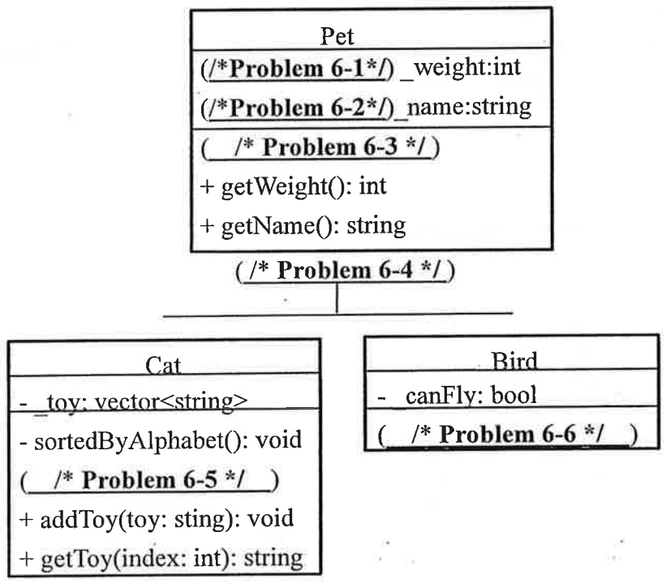
Problem	Answer
5-1	
5-2	
5-3	
5-4	
5-5	
5-6	
5-7	
5-8	
5-9	
5-10	

Please copy the above answer table to your answer sheet

注意：背面尚有試題

Problem 6 [6%, 1% each]

Complete the follow UML class diagram based on Problem 5. Draw a complete UML class diagram on your answer sheet by copying the diagram and filling all the blanks with correct attributes or methods. Notably, you also need to show the inheritance relationships between the classes.



Problem	Answer
6-1	
6-2	
6-3	
6-4	
6-5	
6-6	

Please copy the above answer table to your answer sheet