ID_____ Name: _____

1. (5 marks) Java has a short-circuit boolean evaluation. Using Java code as example(s), explain the advantage of short-circuit evaluation.

2. (7 marks) Java program is given:

```
class Person{
        int x;
        public Object work(Object x){  … }
}
class Work {
        int x;
        public Object work(Object x) {. . ..}

        public static void main(String[] args){
                Object a;
                if (args[0] ==1)
                        a = new Work();
                else
                        a = new Person();
                a.x =5;
                Work m = a.work(a);
                m.x = 10;
        }
}
```

Is this program correct? If not, explain what is(are) wrong and how should it(they) be fixed. You can create new variables.

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3. Given the C++ code below, choose an answer and fill in the blank for each question.

```
class Mammal {
public:
   virtual void giveBirth() { cout << "I give birth to live young." << endl; }
   void live() { cout << "I live everywhere." << endl; }
};

class Platypus : public Mammal {//subclass of Mammal
public:
   virtual void giveBirth() { cout << "I lay eggs." << endl; }
   void live() { cout << "I live in Australia." << endl; }
};

class PlatypusChild : public Platypus {//subclass of Platypus
public:
   virtual void giveBirth() { cout << "I lay eggs too." << endl; }
   void live() { cout << "I live in Australia too." << endl; }
};

void fnGiveBirth(Mammal *mm) { mm->giveBirth(); }
void fnLive(Mammal *mm) { mm->live(); }

int main ()
{
    Platypus *aPlatypus = new Platypus();
    fnLive(aPlatypus);                      //line1
    fnGiveBirth(aPlatypus);                 //line2
    aPlatypus= new PlatypusChild();
    fnGiveBirth(aPlatypus);                 //line3
}
```

3.1 (2 mark) Which method binding is used at line1?

☐ dynamic method binding ☐ static method binding

What is the printed result of line1? .....

3.2 (2 marks) Which method binding is used at line2?

☐ dynamic method binding ☐ static method binding

What is the printed result of line2? .....

3.3 (2 marks) Which method binding is used at line3?

☐ dynamic method binding ☐ static method binding

What is the printed result of line3? .....

4. (6 marks) A code for language with short-circuit Boolean evaluation is shown below.

```
public static int f(int a, int b, int c, int d, int e, int f) {
        if( (a>b && c> d) || e != f) {
                return 1;

        }else {
                return 2;
        }
}
```

Rewrite this code for a language without short-circuit evaluation.

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5. (4 marks) What are the advantages/disadvantages of reference model of variables? Give examples and discuss.

6. The following information about Java is used:

Java type promotion rules:

Type promotion is an automatic type conversion from a "lesser" base type to a "greater" one. When an operator applies binary numeric promotion to a pair of operands, the following rules apply, in order, using widening conversion to convert operands as necessary:

If either operand is of type double, the other is converted to double.

Otherwise, if either operand is of type float, the other is converted to float.

Otherwise, if either operand is of type long, the other is converted to long.

Otherwise, both operands are converted to type int.

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Java operator predecence and associativity:

Operator	Precedence Level (เรียงจาก level สูงลงไปต่ำ)	Associativity
…	…	…
( ) (cast) …	3	Right to left
…	…	…
+ (additive) + (string concat) …	5	Left to right
&& (conditional AND)	12	Left to right
|| (conditional OR)	13	
= (assignment) …	15	Right to left

6.1 (2 marks)

```
byte a = 1;                    //line1

byte b = 2;                    //line2

byte c = a+b;          //line3, compile error
```

Why is there a compile error at line3?

6.2 (1 mark) How can you fix line3?

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6.3 (2 marks)

```
int i = 5;                          //line4
long j = 8;                         //line5
int k = (int)  i+j;                 //line6, compile error
```

Why is there a compile error when casting the addition between i and j at line6?

6.4 (2 marks) Given an expression:

1 + 2 + "1" + 2 + true;

Is there a type clash? If so, where?

7. (4 marks) Given:

$$f(i) = i\ , if\ 1 \leq i \leq 100$$
$$= 2i, if 101 \leq i \leq 550$$
$$= 3i, if\ 551 \leq i \leq 1000$$
$$= 0, otherwise$$

If a switch can use range (e.g. 1...10). What would you choose to implement this function? Using if-else, or switch? Give your reason.