國立臺北科技大學 102 學年度碩士班招生考試

系所組別：4300 資訊與運籌管理研究所

第一節　計算機概論　試題

注意事項：

1. 本試題共九題，配分共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

一、What does the following program print? (10%)

```
class SideEffect
{
    private int x = 1;
    public void xSet(int xx)
    {
        x = xx;
    }
    public int xGet()
    {
        return x;
    }
}
class Ex1
{
    public static void main(String[] args)
    {
        int p = 1;
        change(p);
        System.out.println(p);
        SideEffect r = new SideEffect();
        change(r);
        System.out.println(r.xGet());
    }
    public static void change(int q)
    {
        q = 2;
    }
    public static void change(SideEffect t)
    {
        t.xSet(5);
    }
}
```

二、What does the following program print? (10%)

```
class Ex2
{
    public static void main (String[] args)
    {
        System.out.println("Start of main");
        try
        {
            f();
        }
        catch (ArithmeticException e)
        {
            System.out.println("Exception");
        }
        System.out.println("End of main");
    }
    public static void f()
    {
        System.out.println("Start of f");
        g();
        System.out.println("End of f");
    }
    public static void g()
    {
        System.out.println("Start of g");
        int x;
        x = 5/0;
        System.out.println("End of g");
    }
}
```

注意：背面尚有試題

三、What does the following program print? (10%)

```
class Ex3
{
    public static void main(String[] args)
    {
        r2(5);
        System.out.println();
    }
    public static void r2(int x)
    {
        if (x == 0)
            System.out.print("E");
        else if (x == 1)
        {
            System.out.print("A");
            r2(6);
            System.out.print("B");
        }
        else
        {
            System.out.print("C");
            r2(x - 2);
            System.out.print("D");
        }
    }
}
```

四、Write a Dynamic Programming algorithm for determining a longest common subsequence between two strings. A subsequence of W is obtained by deleting 0 or more (not necessarily consecutive) symbols from W. A common subsequence between W and X is defined to be a subsequence of both strings. The longest common subsequence problem is to find a longest common subsequence between two strings. For instance, consider $W = abaade$ and $X = caacedc$. The longest common subsequence between W and X is $aaec$. (20%)

五、Virtual memory is the separation of user logical memory from physical memory. Virtual memory is commonly implemented by demand paging. Describe how a demand-paging system works. (10%)

六、A B-tree of order m is an m-way search tree that is either empty or satisfies the following properties: (1) The root node has at least 2 children. (2) All nodes other than the root node and failure nodes have at least $\lceil m/2 \rceil$ children. (3) All failure nodes are at the same level. Show the results of inserting the keys

$F, S, Q, K, C, L, H, T, V, W, M, R$

in order into an empty B-tree of order 3. (10%)

七、Show the red-black trees that result after successively inserting the keys 41, 38, 31, 12, 19, 8 into an initially empty red-black tree. (10%)

八、Consider inserting the keys 54, 12, 16, 23, 6, 13, 82, 28, 31 into a hash table of length $m = 11$ using open addressing with the auxiliary hash function $h'(k) = k \bmod m$. Show the result of inserting these keys using quadratic probing. Quadratic probing uses a hash function of the form $h(k,i) = (h'(k) + i + 3i^2) \bmod m$, $i = 0,1,2,\cdots$. (10%)

九、Describe the use of the real-time transport protocol (RTP) and, by means of a diagram, show its position in relation to the TCP/IP protocol stack. (10%)