

2007 Paper 10 Question 1

Foundations of Programming

- (a) Distinguish between the terms *abstract class* and *interface*. [3 marks]
- (b) Explain in detail what happens when class `GPS` below is instantiated noting, in particular, any assignments that are made. [17 marks]

```
class GPS
{ public int[][] a = new int[4][4];
  private int[] i = new int[1];
  private int[] j = new int[1];

  public GPS()
  { this.j[0] = this.gps(this.j, 4, new Pi(), new Fg());
  }

  private int gps(int[] i, final int N, Pass z, Feval v)
  { i[0] = 0;
    while (i[0]<N)
      { z.p(v.f());
        i[0]++; }
    return 0;
  }

  private abstract class Pass
  { public abstract void p(int n);
  }

  private class Pi extends Pass
  { public void p(int k)
    { GPS.this.i[0] = k; }
  }

  private class Pij extends Pass
  { public void p(int k)
    { GPS.this.a[GPS.this.i[0]][GPS.this.j[0]] = k; }
  }

  private abstract class Feval
  { public abstract int f();
  }

  private class Fij extends Feval
  { public int f()
    { return GPS.this.i[0]+GPS.this.j[0]; }
  }

  private class Fg extends Feval
  { public int f()
    { return GPS.this.gps(GPS.this.i, 4,
                          new Pij(), new Fij()); }
  }
}
```