THE BRITISH COMPUTER SOCIETY

THE BCS PROFESSIONAL EXAMINATION
Certificate

SOFTWARE DEVELOPMENT

18th October 2000 – 2.30 p.m. – 4.30 p.m.

Time: TWO hours

SECTION A

Answer TWO questions out of FOUR from this section. All questions carry equal marks.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

1.   *a)*   Using the line numbers given, dry run the algorithm below when the value read into 'int' is –31. Separately show the output produced.   **(15 marks)**

   b)   Re-write the algorithm as a procedure. Annotate your procedure with suitable comments. State the language used (e.g. Pascal, C).   **(15 marks)**

Algorithm

```
1    READ int
2    IF int DOES NOT EQUAL 0 THEN
3    BEGIN
4          SET length TO 0
5          SET num TO ABSOLUTE VALUE OF int
6          WHILE num IS GREATER THAN 0 DO
7              BEGIN
8                    ADD 1 TO length
9                    SET num TO num INTEGER DIVIDED BY 10
10             END
11         IF int IS GREATER THAN 0 THEN
12             SET sign TO '+'
13         ELSE
14             SET sign TO '-'
15         FOR pos STARTING AT 1 TO length + 2 DO
16             BEGIN
17                   WRITE sign
18             END
19         WRITE A NEWLINE
20         WRITE sign
21         WRITE ABSOLUTE VALUE OF int
22         WRITE sign
23         WRITE A NEWLINE
24         FOR pos STARTING AT 1 TO length + 2 DO
25             BEGIN
26                   WRITE sign
27             END
28   END
```

[Turn over

2. Describe the system software you might find on a Personal Computer (PC). Why is this software necessary and what is its relation to application software? **(30 marks)**

3. A computer-based music enquiry system utilises the following record structure:

   SHEET-MUSIC
      DETAILS
         catalogue-number   (9 digits)
         composer   (20 characters)
         title   (20 characters)
         publisher   (20 characters)
      STOCK
         price   (a real number)
         in-stock-indicator   (TRUE or FALSE)
         number-in-stock   (2 digits)
      LOCATION
         store-number   (2 digits)
         shelf-reference   (4 characters)

   a) Specify this record structure in an appropriate programming language. State clearly the language you have used. **(8 marks)**

   b) How would you set up a file or table in your chosen language capable of holding a variable number of records? **(2 marks)**

   c) Enquiries are to be made for a particular piece of music based on either the catalogue-number or the title. Produce a design, and write the code in your chosen language, to satisfy this enquiry. **(20 marks)**

4. *a)* Compare and contrast **TWO** different software development methodologies. **(15 marks)**

   b) Describe the software development tools that would help support one of the methodologies described in part *a)*. **(15 marks)**

NOW PLEASE ANSWER QUESTIONS FROM SECTION B OVERLEAF ➔

Answer FIVE questions out of EIGHT. All questions carry equal marks.

*The marks given in brackets are **indicative** of the weight given to each part of the question.*

5. Explain what is meant by

    a)   a syntax error
    b)   a run-time error
    c)   a logical error.

    Give an example of each of these using a language of your choice. State the language used.   **(3 x 4 marks)**

6.   Specify a simple sorting algorithm to sort 100 items held in an array.   **(12 marks)**

7.   Iterative structures are common in programming languages. Describe, with examples, **THREE** such structures.
    (12 marks)

8.   *a)*   Write a recursive function to return the factorial of a number, n, defined as:

        factorial(n) = n*(n-1)*(n-2)*…..*2*1   **(6 marks)**

    b)   What is a major limitation on the use of recursion?   **(6 marks)**

9.   *a)*   Explain the difference between sequential and parallel programming.   **(4 marks)**

    b)   Outline a problem where parallel programming would be useful. What characteristics does this problem possess that makes it suitable for parallel programming?   **(8 marks)**

10.   Outline the objectives and principles of software testing.   **(12 marks)**

11.   Files can be accessed either in a sequential or random manner. Give an example, with reasons, where:

    a)   sequential access is preferable to random access

    b)   random access is preferable to sequential access.   **(2 x 6 marks)**

12.   *a)*   Why is system/user documentation important?   **(4 marks)**

    b)   What is the difference between system and user documentation?   **(4 marks)**

    c)   What different forms might user documentation take?   **(4 marks)**