

BCS THE CHARTERED INSTITUTE FOR IT

**BCS HIGHER EDUCATION QUALIFICATIONS
BCS Level 4 Certificate in IT**

SOFTWARE DEVELOPMENT

Wednesday 26th September 2018 – Morning

Time: TWO hours

Section A and Section B each carry 50% of the marks.

You are advised to spend about 1 hour on Section A (30 minutes per question)
and 1 hour on Section B (12 minutes per question).

Answer any Section A questions you attempt in Answer Book A

Answer any Section B questions you attempt in Answer Book B

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

Calculators are NOT allowed in this examination.

Section A

Answer 2 questions (out of 4). Each question carries 30 marks.

A1

- a) Assume teams A and B compete against each other and each has a score at the end. By comparing the scores, it can be decided which team won or if it was a tie. Write a function `winner(A,B)` which returns 1 if the score A is larger than score B, returns 2 if score B is larger and returns 0 if the scores are the same. **(8 marks)**
- b) Write a function `sum(V,N)` which returns the total of the first N numbers in the array V. **(8 marks)**
- c) Now suppose that the monthly sales figures (£, GBP) for shops A and B are available for the past year in arrays `salesA` and `salesB`.

	0	1	2	3	4	5	6	7	8	9	10	11
<code>salesA (£)</code>	22	44	55									
<code>salesB (£)</code>	99	39	55									

A simple method of calculating the winner would be to sum the sales figures for the year and compare the totals for the two shops. How should this calculation be coded to announce the winner?

(6 marks)

- d) However, the owner of the shops has decided on a more elaborate scoring system. For each month, the shop with the most sales is awarded 4 points and the other shop 2 points, but if there is a tie, they are each awarded 3 points. Using the function created in a) write a function called `scoresAB` to calculate the scores for each shop for each month and store them in arrays `scoresA`, `scoresB`. Then using the function created in b) total the scores for each shop and announce the winner for the year.

(8 marks)

- A2** A teacher requires a pass list for a module with some unusual rules. The Coursework is worth 40% of the Overall mark and the Exam is worth 60%. In order to pass the module, the student must have one mark (either the Coursework or the Exam) of at least 40%, with the other achieving at least the minimum mark of 30%. There are 100 students in the class.

	0	1	2	3	4	...	98	99
<i>Student ID</i>	2017001	2017002	2017003	2017004	2017005
<i>Coursework (%)</i>	20	49	51	70	10
<i>Exam (%)</i>	33	50	69	0	80

Write a program to:

- a) Produce a list of all the students who have passed. For each student, list their Student ID, Coursework mark, Exam mark and Overall mark. **(12 marks)**
- b) Produce a separate list of Student IDs for those students who failed. **(12 marks)**
- c) Report the Student ID of the student who should get the module prize (the student with the highest overall mark). **(6 marks)**

[The most marks will be awarded to answers which make good use of functions/subroutines].

A3 The array **x** has been initialised as follows:

index	0	1	2	3	4	5	6	7	8	9	10	11
x	1	9	5	0	8	6	3	5	1	0	2	9

The subroutine **a** in the code below is going to be executed with parameter **b** set to 10 and parameter **c** set to 6.

- a) Trace the call of the function **a (10,6)** and show clearly the results of the call. **(8 marks)**

	function
1	int a(int b, int c){
2	int d,e;
3	e = -1;
4	d = 0;
5	while(d < b){
6	if(x[d] == c)
7	e = d;
8	d++;
9	}
10	return(e);
11	}

- b) Write a brief summary of what the subroutine does. **(6 marks)**
- c) Decide on better names for the identifiers (the subroutine name, its parameters and the variables) and rewrite the code using these new names and including suitable comments. **(10 marks)**
- d) Rewrite lines 5 to 9 using a for-loop instead of a while-loop. **(6 marks)**

- A4** a) Consider the code below and format it in a more familiar, human-readable form.

```
char compare(int p1,int p2){if(p1==p2)return('=');  
else if(p1>p2)return('>');else return('<');}
```

(6 marks)

- b) Referring to the code in part a), find and write out the following:

- i) All the different identifiers.
- ii) All the different constants.
- iii) All the different operators.
- iv) A conditional (logical, boolean) expression .
- v) A conditional statement.

[Note that you should copy out exactly what is requested and no more]

(5 x 2 marks)

- c) If, by mistake, the programmer wrote (p1=p2) instead of (p1==p2) how would that change the behaviour of the code?

(8 marks)

- d) Consider the following 3 statements:

```
v = 2 ;  
v = '2' ;  
v = two ;
```

They could all be read out loud by saying "v is assigned two", but they are all different. Briefly describe the differences.

(6 marks)

Section B
Answer 5 questions (out of 8). Each question carries 12 marks.

- B5** Conversion of a decimal number to its binary equivalent is carried out using the following technique:

The decimal number is successively divided by 2 and the remainders are stored.

The remainders, in reverse order form the binary number; the last remainder being the most significant digit. In the example below 19 (decimal) = 10011 (binary)

Process	Quotient	Remainder
÷2	19	1 (least significant bit)
÷2	9	1
÷2	4	0
÷2	2	0
÷2	1	1 (most significant bit)
	0	

Write pseudocode or a program, in a language of your choice, in which a decimal number is input and its binary equivalent is output. Only positive integer decimal numbers are to be considered.

(12 marks)

- B6** Briefly define the following terms:

- | | |
|-----------------------|------------------|
| a) Library programs . | (3 marks) |
| b) Truncation. | (3 marks) |
| c) Encryption. | (3 marks) |
| d) Pointer. | (3 marks) |

- B7** Search and Sort operations are commonly used on data.

- | | |
|--|------------------|
| a) Explain the difference between searching and sorting in computers. | (2 marks) |
| b) Describe the operation of the binary chop search in a sorted array, assuming the target value is in the array. The answer can be described in words or by pseudocode or by actual program code. | (8 marks) |
| c) Explain why a binary chop search is more efficient than a linear or sequential search. | (2 marks) |

- B8**

- | | |
|--|------------------|
| a) Explain the term machine code. | (2 marks) |
| b) Describe the process of translating the assembly language code using an assembler. | (6 marks) |
| c) Describe ONE advantage and ONE disadvantage of writing programs in assembly language compared to a high level language. | (4 marks) |

Turn over

B9 Documentation is an important part of the process of software development. Write brief notes on documentation to answer the following questions:

- a) Why is documentation important? (2 marks)
- b) Who is it for? (2 marks)
- c) What does it consist of? (2 marks)
- d) How is it produced? (2 marks)
- e) When is it produced? (2 marks)
- f) What problems can be experienced with documentation? (2 marks)

B10 Write BRIEF notes to compare and contrast the following pairs of terms:

- a) Data structure and program structure. (4 marks)
- b) Black box test and white box test. (4 marks)
- c) Data validation and data verification. (4 marks)

B11

- a) Explain the term 'debugging'. (4 marks)
- b) In a simple programming environment where the programmer has only the standard output facilities of the programming language to use, how can debugging be approached? (4 marks)
- c) What extra facilities to assist in debugging might be provided in a more extensive development environment? (4 marks)

B12 One particular software development method is named the waterfall method.

- a) Write out the names of all the phases in the method. (3 marks)
- b) Choose THREE phases and write a brief description of each of the three phases chosen. (9 marks)