OXFORD CAMBRIDGE AND RSA EXAMINATIONS

AS LEVEL
H046/02
COMPUTER SCIENCE
Algorithms and problem solving
TUESDAY 14 JUNE 2016: Afternoon
TIME ALLOWED: 1 hour 15 minutes
plus your additional time allowance
MODIFIED ENLARGED 24pt

First name		Last name	

Centre number					Candidate number				

DO NOT USE:
a calculator

READ INSTRUCTIONS OVERLEAF

INSTRUCTIONS

Use black ink.

Complete the boxes on the first page with your name, centre number and candidate number.

Answer ALL the questions.

Write your answer to each question in the space provided.

If additional space is required, you should use the lined page(s) at the end of this booklet. The question number(s) must be clearly shown.

INFORMATION

The total mark for this paper is 70.

The marks for each question are shown in brackets [ ].

Quality of extended responses will be assessed in questions marked with an asterisk (*).

BLANK PAGE

1 **Programming languages consist of three basic programming constructs. For each construct, state its name and give a working example.**

Construct 1: _____

Example: _____

_____

_____

_____

Construct 2: _____

Example: _____

_____

_____

_____

Construct 3: _____

Example: _____

_____

_____

_____

[6]

BLANK PAGE

2* **A software company is going to write a policy on its use of variables when writing programs. The policy will cover the use of local and global variables and variable naming rules and conventions.**

Discuss the content of this policy and why it is required. **[9]**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

3 (a) A software development company is planning to produce a bespoke monitoring system for a factory which produces hazardous chemicals. One testing strategy is whitebox testing.

State the name of THREE other testing strategies that the company could use.

1 _____

2 _____

3 _____ **[3]**

(b) The company decide to use whitebox testing. Justify why whitebox testing is used in this case.

_____

_____

_____

_____

_____

_____

_____

_____ **[3]**

(c) A temperature control system monitors and regulates temperature by switching a heater on or off. The temperature sensor of the system provides a reading accurate to 3 decimal places (e.g. 87.489). There are two warning lights, amber and red. The system controls the temperature and warning lights as follows:

The heater is turned off when the sensor reading is 97.500.

The heater is turned on when the sensor reading is 95.000.

The red warning light is on when the sensor reading is 98.100 or above.

The amber warning light is on when the sensor reading is outside the range 95.000 to 97.500 (inclusive), and the red warning light is NOT on.

Complete the boundary test table on the opposite page.

[5]

Sensor value	Output	On/off
94.999	Amber light	on
95.000	Heater	
	Amber light	
97.500	Heater	
	Amber light	
97.501	Amber light	
98.099	Amber light	
	Red light	
98.100	Amber light	
	Red light	

4 **(a)** Describe the steps involved in a binary search to find the value 47 in the list below.

4, 7, 8, 21, 46, 47, 51

_____

_____

_____

_____

_____

_____

_____

_____

[4]

(b) A programmer has been tasked with writing a function that uses a binary search to return a Boolean value. The function should return `true` if the target integer is found in a list of integers. Using pseudocode, write an algorithm for the function. **[8]**

_____

_____

_____

_____

_____

13

(c) The target integer 8 exists in a list of integers
   1, 4, 6, 9, 8, 12, 15 but is not found during a binary search.
   There are no errors in the code.

   (i) Give the reason why the target integer 8 is NOT found.

   _____

   _____ [1]

   (ii) Identify and describe an alternative search algorithm
        that could be used.

   _____

   _____

   _____

   _____

   _____ [3]

(d) A stack, in shared memory, is being used to pass a single variable length ASCII string between two sub-systems. The string is placed in the stack one character at a time in reverse order with the last byte holding the number of characters pushed i.e the text "SILVER" would be held in the stack as:

6	← Top
S
I
L
V
E
R
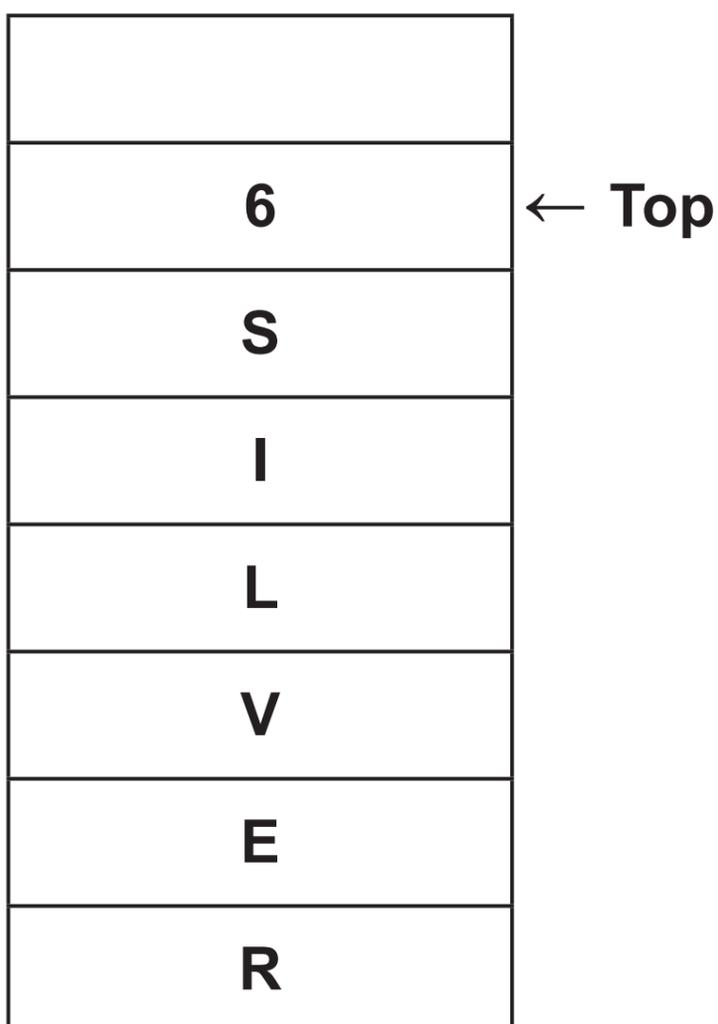
Use pseudocode to write a procedure that will take a text string passed to it and push it to the stack in the format defined above. You may assume any given input will fit in the stack. [6]

_____

_____

_____

_____

_____

_____

16

BLANK PAGE

5   A car racing team uses a car simulator to test their drivers in a range of cars on different race tracks.

(a) The car simulator uses an abstraction of the real car and race track. Identify TWO ways in which the simulator could use abstraction.

1 _____

_____

2 _____

_____ **[2]**

(b) Identify THREE inputs that will be required to configure the initial conditions for running the simulation.

1 _____

2 _____

3 _____ **[3]**

BLANK PAGE

6   (a) A programmer is going to design a procedure that will prompt for and receive two values, A and B. The procedure will then compare them. The procedure will also write a suitable message to a file on disk depending on whether:

the values are the same

A is less than B, or

B is less than A.

Use pseudocode to write the procedure. [5]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____
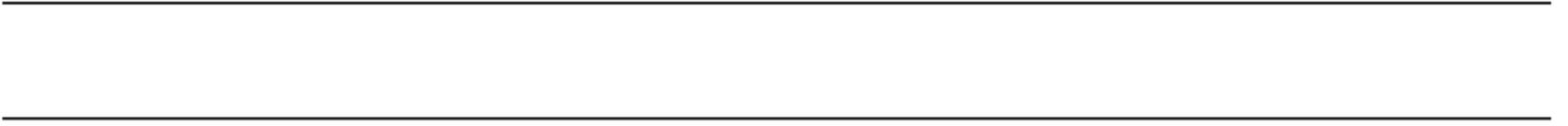
(b) The code below uses a procedure:

```
name = "Sam"
addMessage(name)
print(name)

procedure addMessage(inText:byVal)
     inText = "Hello " + inText
endprocedure
```

Explain why this program outputs `Sam` rather than `Hello Sam`.

_____

_____

_____

_____ **[2]**

(c) Explain the advantages of writing an application using a modular approach.

_____

_____23_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ **[6]**

23

7 Given the following pseudocode:

```
d = 5

if ((a > b) OR (b >= c))  then
    if ((c < a ) XOR (c < b)) then // Check to see if one or the other
                                   // comparisons are TRUE, but not both
        d = 15
    else
        d = 16
    endif
else
    d = 14
endif

print(d)
```

(a) State the value of d if a=42, b=41 and c=42

_____

(b) State the value of d if a=42, b=36 and c=4

_____

(c) State the value of d if a=42, b=36 and c=36

_____

(d) Give ONE potential value of b if the output value of a=42, c=44 and d=14.

_____

[4]

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).