OCR A-Level Computer Science
H446/01: Computer Systems
Practice Examination

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Write your answer to each question in the space provided.
- Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do not write in the barcodes.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- The total number of marks for this paper is 40.
- This document consists of 8 pages.
- Quality of extended responses will be assessed in questions marked with an asterisk (*).
- The time allowed for this examination is 1 hour.

Name:	
Centre Number:	Candidate Number:
Date:	

Grade Boundaries	**A***	**A**	**B**	**C**	**D**
Mark	36	32	28	24	20

Question 1

(a) Define the term *primitive data type* and give two examples of primitive data types. [3]

(b) Explain the difference between a *stack* and a *queue* data structure. [4]

(c) Describe how a *hash table* stores and retrieves data. [3]

Question 2

(a) Convert the following decimal numbers to 8-bit binary:

(i) 67 [1]

(ii) 198 [1]

(b) Perform the following binary arithmetic operations, showing your working:

(i) 10110101 + 00101101 [2]

(ii) 11010000 - 01001101 [2]

(c) Convert the hexadecimal number 3A7F to:

(i) Binary [2]

(ii) Decimal [2]

Question 3

(a) The following pseudocode shows a binary search algorithm:

```
FUNCTION BinarySearch(array, target)
    left = 0
    right = LENGTH(array) - 1

    WHILE left <= right DO
        mid = (left + right) DIV 2

        IF array[mid] == target THEN
            RETURN mid
        ELSE IF array[mid] < target THEN
            left = mid + 1
        ELSE
            right = mid - 1
        ENDIF
    ENDWHILE

    RETURN -1
ENDFUNCTION
```

(i) What are the pre-conditions for this algorithm to work correctly? [2]

(ii) Trace through the algorithm for the array [3, 7, 11, 15, 18, 21, 25] and target value 15, showing the values of left, right, and mid at each iteration. [4]

(b) Compare and contrast the time complexity of binary search with linear search. [4]

Question 4*

A software developer needs to implement a system to manage a library's book collection.

(a) Design a suitable data structure to store information about books in the library, including title, author, ISBN, publication year, and availability status. Justify your choice of data structure. [4]

(b) The library needs to implement a function to search for books by title. Discuss two different search algorithms that could be used, comparing their efficiency for this specific application. [6]