2.3 Algorithms: Complexity, Searching and Sorting: 10-minute Pack

OCR H446 · Calculators not allowed · about 10 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

1 A stock-control system for a small hardware shop in Leeds stores unsold item codes in an array called stock. The array is not sorted. All arrays in this paper are indexed from 0, so an array with n items has indices 0 to n - 1. Pseudocode follows OCR's Exam Reference Language conventions (assignment <-, iteration FOR ... NEXT / WHILE ... ENDWHILE / DO ... UNTIL, selection IF ... ENDIF).

```
FUNCTION LinearSearch(stock, target) RETURNS INTEGER
  FOR i <- 0 TO LEN(stock) - 1
    IF stock[i] = target THEN
      RETURN i
    ENDIF
  NEXT i
  RETURN -1
ENDFUNCTION
```

stock = [12, 7, 19, 3, 25, 8]

(a) Complete the trace table below to show LinearSearch(stock, 25) being called. Add a row for each value of i tested, showing stock[i] and whether stock[i] = target is true or false. **(5)**

i	stock[i]	stock[i] = target?
0		
1		
2		
3		
4		

(b) State the value returned by the function call in part (a). **(1)**

(c) The array is now searched for the value 30, which is not present. State the number of times the condition stock[i] = target is tested, and give the value returned by the function. **(2)**

(d) State, using Big O notation, the worst-case time complexity of linear search on a list of n items. **(1)**

(Total for Question 1 is 9 marks)

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Mark scheme · 2.3 Algorithms: Complexity, Searching and Sorting: 10-minute Pack

Question 1

(a) i=0: stock[0]=12, false **B1**

(a) i=1: stock[1]=7, false **B1**

(a) i=2: stock[2]=19, false **B1**

(a) i=3: stock[3]=3, false **B1**

(a) i=4: stock[4]=25, true (loop stops, RETURN 4) **B1**

(a) Answer: i=0 (12,F), i=1 (7,F), i=2 (19,F), i=3 (3,F), i=4 (25,T) -> returns 4

(b) 4 ft from (a) **B1**

(b) Answer: 4

(c) 6 comparisons made (every element is tested since the target is absent) **B1**

(c) returns -1 **B1**

(c) Answer: 6 comparisons are made; the function returns -1.

(d) O(n) **B1**

(d) Answer: O(n)

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