1(a). An online supermarket keeps a record of a customer's favourite items based on what they have ordered in the past. The list (barcodes) of favourite items is kept in a serial file called **Favourites.dat**. When an item is added to the online shopping basket, its barcode is passed to procedure **UpdateFavourites**, which checks to see if it is already in the favourite items file. If it is not, the procedure appends the item to the end of the favourite items file.

Assume the Favourites.dat file exists. Write an algorithm for the procedure **UpdateFavourites**.

[8]

(b). The supermarket has decided to change the favourite items file from serial to a sequential file.

Explain how you would search the sequential file to find the target record.

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_____[5]

2(a). The procedure below manipulates a passed integer value and gives a single or multiple outputs.

```
PROCEDURE ChangeInteger(Value:INTEGER)

INTEGER P, X, M

REPEAT

P = Value DIV 10
X = P * 10
M = Value – X
OUTPUT M
Value = P

UNTIL Value <= 0

OUTPUT '+'

END PROCEDURE
```

For example, ChangeInteger(1234) would output 4 3 2 1 +

(i) Complete the trace table for the following procedure call ChangeInteger(4082).

Value	P	X	M	OUTPUT

[3]

(ii) Complete the trace table for the following procedure call ChangeInteger(-243).

Value	P	X	M	OUTPUT

[2]

(b). The output produced for a negative value is not in the correct format of digit(s) and a single sign. Modify the procedure ChangeInteger to give the correct format output for both positive and negative values.

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END OF QUESTION PAPER

Question			Answer/Indicative content	Marks	Guidance

1	a		• Open Favourites.dat
			• Set FOUND flag to FALSE
			• Loop { includes correct end condition }
			• Read record from Favourites file
			  If record from Favourites file = barcode passed …
			• … FOUND flag set to TRUE Until EOF Favourites.dat OR FOUND=TRUE
			  Close Favourites file
			• IF FOUND = FALSE Open Favourites file
			• Write barcode to Favourites file
			• Close Favourites file
				8	Ignore for this question file open mode (i.e. WRITE,READ & APPEND)
					
					Allow the use of flags to indicate EOF of files
					
					Accept flow chart solutions – if the flow is right for item fond and not found also award bullet points 2, 5 & 6 (Found flag)
					
					A fully working solution should be given full marks regardless of efficiency.
					
					Examiner's Comments
					
					As with all algorithm questions this was poorly answered, with most candidates only achieving the open and close file marks. Most of the candidates did not know how to process a file and read records from the file. A typical answer was to treat the file as an array, for example to access a record they used "Favourites.dat[i]" or to iterate through the file "for i to Favourites.dat.length", so achieving no marks. The lack of detail in the algorithm was also a problem with statements such as "if Barcode not in file add to file".

Question			Answer/Indicative content	Marks	Guidance

	b		Basic structure to be described:
			
			Open file
			
			• Loop {includes correct end condition}
			    ○ Read record
			     If target = record read
			      ■ Return found
			     End if
			    ○ If target > record read
			      Return not found
			     End if
			   Until EOF
			   Close file
			• Return not found
				5	Accept a binary search
					
					• Find centre point
					• Is target equal to value? If yes return found
					• If left pointer = right pointer then return not found
					• Else take correct subset
					• Repeat bullets 1, 2, 3 & 4
					
					Examiner's Comments
					
					The main problem the candidates had with this question is that they described how to find the record in an index sequential file and not a sequential file. It is extremely difficult to describe the required search using prose but this is what nearly all responses tried to do. Many candidates referred to "check if it's the right record and if not repeat" without saying exactly what to repeat and without reading a record anyway. They may have found a numbered bullet point response easier.

			Total	13	

Question			Answer/Indicative content	Marks	Guidance
2	a	i		3	If zero marks then mark the first row. Ignore duplicate zeros at the end of the first 4 columns.

Value	P	X	M	OUTPUT
4082	408	4080	2	2
408	40	400	8	8
40	4	40	0	0
4	0	0	4	4
(0)				+

- Columns Value & P correct
- Columns X & M
- Column OUTPUT correct

Question			Answer/Indicative content	Marks	Guidance
		ii		2	

Value	P	X	M	OUTPUT
−243	−24	−240	−3	−3
(−24)				+

- Columns Value, P and X correct
- Columns M & OUTPUT correct

Question			Answer/Indicative content	Marks	Guidance

	b		Example answer:
			
			PROCEDURE
			ChangeInteger(Value:INTEGER)
			
			    INTEGER P, X, M
			    BOOLEAN NegativeFlag = FALSE
			
			    IF Value < 0 THEN
			       Value = Value*–1
			       NegativeFlag = TRUE
			    END IF
			
			    REPEAT
			
			       P = Value DIV 10
			       X = P* 10
			       M = Value –X
			       OUTPUT M
			       Value = P
			
			    UNTIL Value <= 0
			
			    IF NegativeFlag = TRUE THEN
			       OUTPUT '–'
			    ELSE
			       OUTPUT '+'
			    END IF
			
			END PROCEDURE
			
			• Checking to see if Value is less than zero
			• Correct output of negative value digits …
			• … and still correctly outputting positive value digits.
			• Output of correct sign
				4	Alternative possible solution is to use ABS(M).
					
					<u>Examiner's Comments</u>
					
					Few candidates achieved all the marks here but many did spot the need to check if value < 0 and convert the –ve to +ve or change the sign. They were some interesting ways of converting (not all correct) -ve to+ve e.g. value = value - (2*value).

			Total	9	