Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/23**

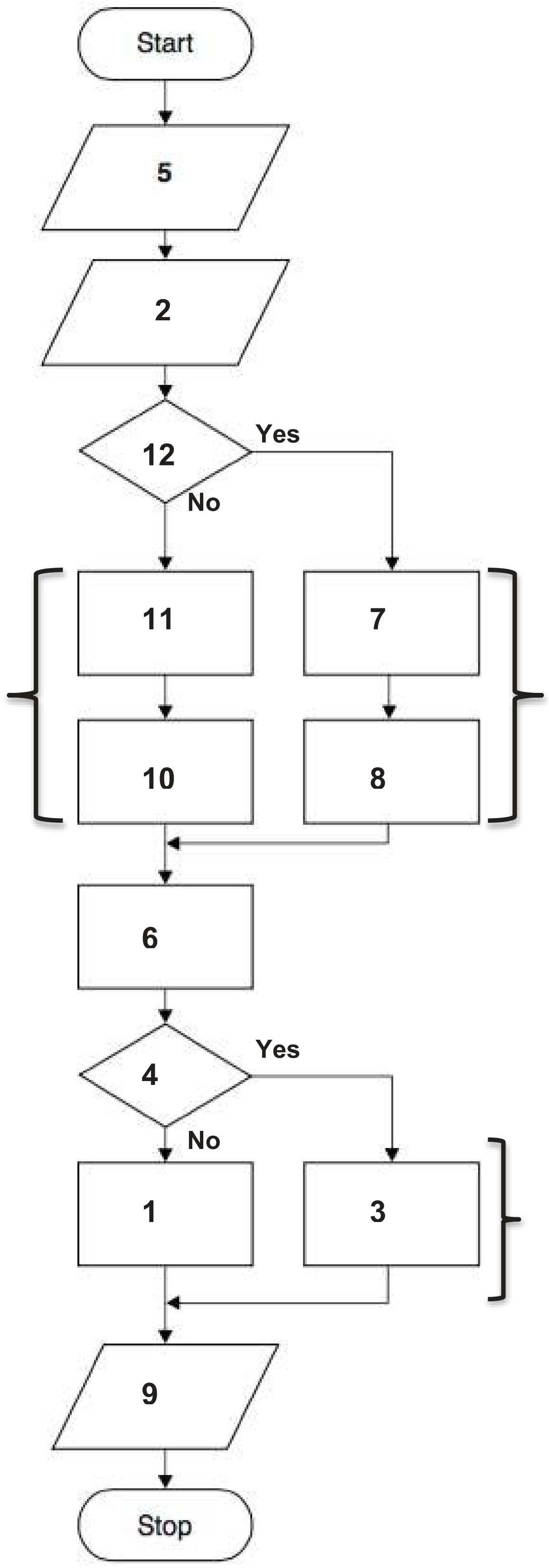
Paper 2 Written Paper **October/November 2016**

MARK SCHEME

Maximum Mark: 75

Published

1 (a)



Note: Order of 11, 10 and 7,8 may be reversed.

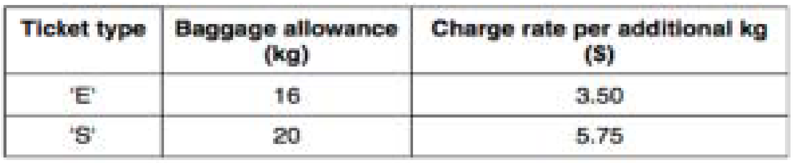
One mark for each of the following symbols / symbol combinations:

- 2
- 7 and 8 from YES
- 10 and 11
- 6
- 1 and 3 (1 from NO, 3 from YES)
- 9
- 12 and 4

Max [6]

(b) Rows 2 to 7 are examples only

TicketType	BaggageWeight	Explanation	Expected output
E	15	Under the allowance	0
E	> 16	Under the allowance	*Charge*
S	<= 20	Under the allowance	0
S	> 20	Under the allowance	*Charge*
E	16	Boundary weight for a type E ticket	0
S	20	Boundary weight for a type S ticket	0
E or S	negative or non-numeric	Invalid weight	Error message



Ticket type	Baggage allowance (kg)	Charge rate per additional kg ($)
'E'	16	3.50
'S'	20	5.75

One mark for each different test (examples above) **Max [5]**

(c)
```
INPUT TicketType
WHILE NOT (TicketType = 'E') OR (TicketType = 'S')
   INPUT TicketType
ENDWHILE
```

One mark for each of:
- `WHILE ... ENDWHILE`
- Correct condition <u>in a loop</u>
- `INPUT` within loop plus one before loop // alternative arrangement leading to correct exit from loop **[3]**

2 (a)

Status2	ReadingCount	ThisBit	BitCount	OUTPUT
			0	
1	1	1	1	
	2	0	1	
	3	1	2	
	4	1	3	
	5	1	4	
	6	0	4	
1				
	1	1	5	Error – Investigate
			0	
	2	1	1	
	3	0	1	
	4	0	1	
	5	1	2	
	6	1	3	
0				

1 must 'follow' 6 as shown by arrow. Can have only 1 or nothing above.

0 must 'follow' 6 as shown by arrow. Can have only 1 or nothing above.

One mark per area outlined **[7]**

(b) One mark for each of:

- Assignment: 01 // 02 // 06 // 09 // 14 // 18
- Selection: 07 // 11
- Iteration: 03 // 05 **[3]**

3 (a) (i) 7 **[1]**

(ii) 103 **[1]**

(iii) 'K' **[1]**

(iv) "come" **[1]**

(b) (i)

```
PROCEDURE CalculateCustomerID
   OUTPUT "Key in surname"
   INPUT Surname
   Length ← CHARACTERCOUNT(Surname)
   CustomerID ← 0
   FOR i ← 1 TO Length
      //NextChar is a single character from Surname
      Nextchar ← 1 SUBSTR(Surname, i, 1) // ONECHAR(Surname, i)
      NextCodeNumer ← ASC(NextChar)
      CustomerID ← CustomerID + NextCodeNumber
   ENDFOR
   OUTPUT "Customer ID is ", CustomerID
ENDPROCEDURE
```

One mark per phrase in **bold** **[3]**

(ii) 'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix.

```
PROCEDURE CalculateCustomerID
   DECLARE Surname : STRING
   DECLARE NextChar : CHAR
   DECLARE NextCodeNumber, i, CustomerID, SLength : INTEGER
   OUTPUT "Key in surname"
   INPUT Surname
   SLength ← LEN(Surname)
   CustomerID ← 0
   FOR i ← 1 TO SLength
      //NextChar is a single character from Surname
      Nextchar ← MID(Surname, i, 1)
      NextCodeNumber ← ASC(NextChar)
      CustomerID ← CustomerID + NextCodeNumber
   ENDFOR
   OUTPUT "Customer ID is ", CustomerID
ENDPROCEDURE
```

Mark as follows:

- Declaration of Surname as STRING and NextChar as CHAR and any three INTEGERs
- Prompt and Input
- Calculation of string length
- FOR Loop to process all characters in the string
- Assignment to NextChar in a loop
- Assignment to NextCodeNumber in a loop
- Totalling CustomerID in a loop
- Output following a loop **[6]**

(c) (i) Visual Basic

```
Function CalculateCustomerID(ByVal AnyName AS STRING) As Integer
```

Pascal

```
FUNCTION CalculateCustomerID(AnyName : STRING) : INTEGER
```

Python

```
def CalculateCustomerID(AnyName):
```

Mark as follows:

- Correct keyword + Function name
- Single input parameter of correct type
- Return parameter type **[3]**

(ii) Visual Basic

```
Return customerID // CalculateCustomerID = CustomerID
```

Pascal

```
Result := CustomerID // CalculateCustomerID := CustomerID
```

Python

```
Return CustomerID
```

[1]

(iii) Visual Basic

```
ThisID = CalculateCustomerID ("Wilkes")
```

Pascal

```
ThisID := CalculateCustomerID ('Wilkes')
```

Python

```
ThisID = CalculateCustomerID ("Wilkes")
```

One mark per underlined element **[3]**

(d) (i)
- Built-in functions are made available by the programming language / already in the system
- Built-in functions are ready made and tested
- User-defined functions can be modified // built-in cannot be modified
- User defined functions can be designed to meet the user's requirements
- User-defined functions can only be used in that program / module **[Max 2]**

(ii)
- They have an identifier name
- They return a value
- They have none, one or more arguments
- Both perform a specific task
- Both represent re-usable code
- Both are 'called' **[Max 2]**

4 (a)
- Create / modify the <u>source code</u> using the <u>text editor</u>
- Compiler <u>translates</u> the source code
- <u>Compiler</u> produces the <u>object code</u> **[Max 3]**

(b) (i)
- Errors in keywords are highlighted // before the compilation process
- Provides line-by-line syntax checking as code is typed in
- Provides line number of the error
- Display of known identifier names
- Auto-complete
- Colour-coding
- Auto-indent
- type checking
- Subroutine parameter checking **[Max 1]**

(ii)
- Set break-points
- Single step / step into/over subroutine
- Window to watch the changing value of variables **[Max 1]**

(c) (i)

```
OPEN "PRODUCTS" FOR READ
i ← 1
WHILE NOT EOF("PRODUCTS")

   READFILE ("PRODUCTS", PCode[i])
   READFILE ("PRODUCTS", PDescription[i])
   READFILE ("PRODUCTS", Temp // PRetailPrice[i])

   PRetailPrice[i] ← TONUM(Temp)

   i ← i + 1
ENDWHILE

CLOSE "PRODUCTS"
OUTPUT "Product file contents written to arrays"
```

One mark per bold phrase (three READFILE() counts as a single mark) **[5]**

(ii) Benefit:

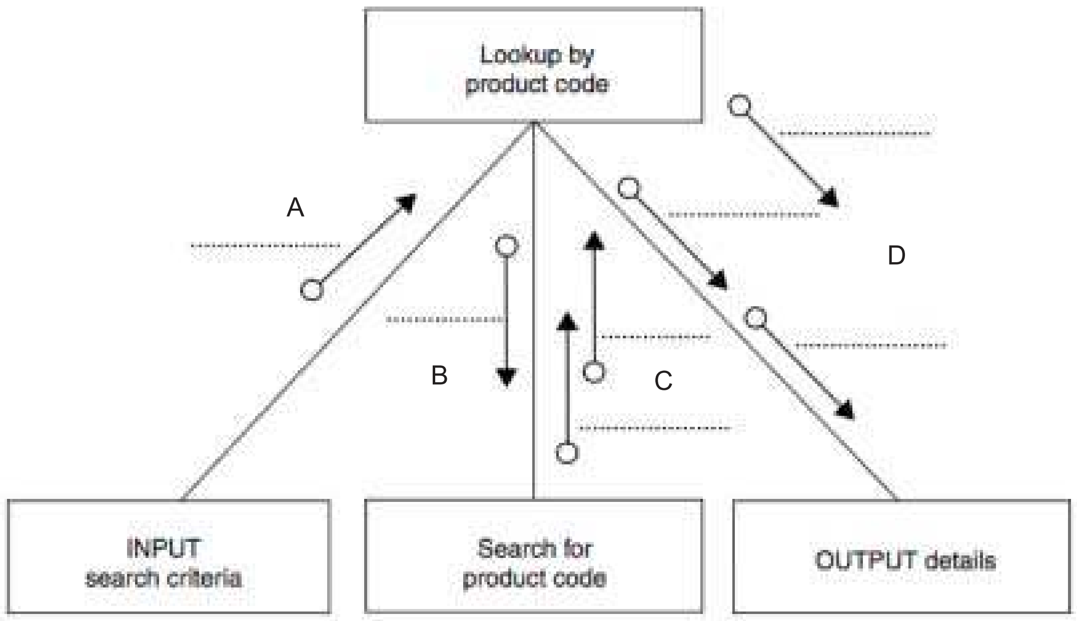
- The number of file read operations is reduced (by 2/3rds)
- It may use less storage / space in the file if strings are NOT fixed length
- All the data related to a single product is read at once / in one file operation / grouped together

Drawback:

- The program will need to use the string handling functions to isolate each of the three items of data
- Difficult to isolate data items if the format is not consistent
- More difficult to search

Max one benefit and one drawback **[2]**

(d)



One mark per group (one or more names) as follows:

A: SearchCode
B: SearchCode // ThisIndex
C: ThisRetailPrice, ThisDescription
D: SearchCode, ThisDescription, ThisRetailPrice **[4]**

(e) 'Pseudocode' solution included here for development and clarification of mark scheme. Programming language example solutions appear in the Appendix.

```
FUNCTION ProductCodeSearch(AnyName : String) RETURNS : Integer
   DECLARE FoundPos : Integer
   DECLARE i : Integer

   i ← 1
   FoundPos ← -1

   REPEAT
      IF AnyName = PCode[i]
         THEN
         FoundPos ← i
      ELSE
         i ← i + 1
      ENDIF
   UNTIL (i = 1001) OR (FoundPos <> -1)

   RETURN FoundPos

ENDFUNCTION
```

Mark as follows:

- Function header returns INTEGER
- Initialisation of index variable
- Loop through array PCode (including exit when found)
- Comparison of AnyName with PCode[i] <u>in a loop</u>
- Increment index variable <u>in a loop</u>
- Return index if AnyName found AND return -1 if AnyName not found **[Max 6]**

5 **(i)** 13 / 13.0 **[1]**

(ii) 18.6 **[1]**

(iii) TRUE **[1]**

(iv) 32 **[1]**

(v) 22 **[1]**

*** End of Mark Scheme – Example program code solutions follow ***

Appendix – Example program code solutions

3(b)(ii): Visual Basic

```
Dim Surname As String
Dim NextChar As Char
Dim NextCodeNumber As Integer
Dim i As Integer
Dim CustomerID As Integer
Dim SLength As Integer

Console.Write("Key in surname ")
Surname = Console.ReadLine
SLength = Len(Surname)
CustomerID = 0
   For i = 1 To SLength
      \\ NextChar is a single character from surname
      NextChar = Mid(Surname, i, 1)
      NextCodeNumber = Asc(NextChar)
      CustomerID = CustomerID + NextCodeNumber
   Next

   Console.WriteLine("Customer ID is " & CustomerID)
```

3(b)(ii): Pascal

```
Var Surname : string;
   SLength, i, CustomerID, NextCodeNumber : integer;
   NextChar : char;
begin
   Writeln ('Enter the surname: ');
   Readln (Surname);
   SLength := Length(Surname);
   CustomerID := 0;
   For i := 1 to SLength do
      begin
         NextChar := SurName[i];
         NextCodeNumber := Ord(NextChar);
         CustomerID := CustomerID +  NextCodeNumber;
      end;
   Writeln ('Customer ID is  ', CustomerID);
   Readln;
end.
```

3(b)(ii): Python

```
# Surname String
# NextChar Char
# NextCodeNumber, I, CustomerID, SLength Integer

Surname = input("Key in Surname ")
SLength = len(Surname)
CustomerID = 0

for i in range(SLength):
   # NextChar is a single character from surname
   NextChar = Surname[i]
   NextCodeNumber = ord(NextChar)
   CustomerID = CustomerID + NextCodeNumber

print("Customer ID is " + str(CustomerID))
```

4(e): Visual Basic

```
Function ProductCodeSearch(ByVal SearchCode As String) As Integer
   Dim FoundCode As Integer
   Dim i As Integer

   i = 1
   FoundCode = -1

   Do
      If SearchCode = PCode(i) Then
         FoundCode = i
      Else
         i = i + 1
      End If
   Loop Until i = 1001 Or FoundCode <> -1
   Return FoundCode
End Function
```

4(e): Pascal

```
Function ProductCodeSearch (SearchCode : String): integer;

   var FoundCode, ThisIndex : integer;
         Found : Boolean;

   Begin
      Found := false;
      ThisIndex := 1;
      Repeat
         If SearchCode = PCode[ThisIndex] then
            Begin
               FoundCode := ThisIndex;
               Found := true;
               Else
                  ThisIndex := ThisIndex + 1;
            end;
      Until (ThisIndex = 1001) OR (Found);
      If Found = false then
         FoundCode := -1
      ProductCodeSearch := FoundCode;
   end.
```

4(e): Python

```
def ProductCodeSearch(SearchCode):
   # list indexes start at zero
   i = 0
   Found = "no"
   while not(i == 1001 or Found == "yes"):
      if SearchCode == PCode[i]:
         Found = "yes"
         FoundIndex = i
      else:
         i = i + 1

   if Found == "no":
      FoundIndex = -1

   return FoundIndex
```