CAMBRIDGE INTERNATIONAL EXAMINATIONS
Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9608 COMPUTER SCIENCE
9608/42   Paper 4 (Written Paper), maximum raw mark 75

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1 (a) (i)

Activity

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
A	▓																												
B		▓																											
C			▓	▓	▓	▓	▓	▓																					
D									▓	▓																			
E											▓	▓																	
F													▓	▓															
G															▓	▓													
H			▓																										
J				▓	▓	▓																							
K											▓	▓	▓	▓															
L															▓	▓													
M																	▉												
N																		▉											
Week Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

1 mark for each square   [2]

(ii) week number 18

Allow follow through   [1]

(b) (i)

Activity	Description	Weeks to complete
A	Write requirement specification	1
B	Produce program design	1
C	Write module code	7
D	Module testing	2
E	Integration testing	2
F	Alpha testing	2
G	Install software and carry out acceptance testing	2
H	Research and order hardware	1
J	Install delivered hardware	3
K	Write technical documentation	4
L	Write user training guide	2
M	Train users on installed hardware and software	1
N	Sign off final system	1

Activity

Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
A	■																												
B		■																											
C			■	■	■	■	■	■	■				■	■															
D									■	■				■	■														
E											■	■				■	■												
F																		■	■										
G																							■	■					
H			■																										
J																				■	■	■							
K																■	■	■	■										
L																							■	■					
M																									■				
N																										■			
Week Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29

1 mark per activity (but 1 mark for activity M and N)
Notes:
C must be after E (1 or 2 later is ok)
D, E, F correct relative to C
J must start in week 20 (allow 21, 22)
G must come after the end of J (f.t.)
K finishes after or at same time as F
L finishes at the same time as G **and after the end of J** (or 1-2 weeks later)
M starts **when everything else has finished**. N after or at same time as M   [9]

(ii) week number: 26

Allow f.t.   [1]

2 (a) `parent(ali, ahmed).`
`parent(meena, ahmed).`

Accept statements in either order
Wrong capitalisation minus 1 mark   [2]

(b) `P =`
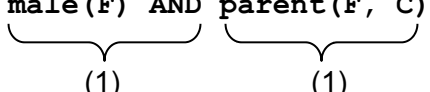**ahmed**
aisha

Ignore capitalisation
Deduct 1 mark for every extra result   [2]

(c) `mother(M, gina).`

Accept `parent(M, gina) AND female(M).` Accept a comma instead of `AND`
Reject `mother(M, gina) IF female(M) AND parent(M, gina).`
Ignore capitalisation   [1]

(d) `father(F, C)`
`IF`
male(F) AND parent(F, C).

    (1)   (1)   [2]

(e) `brother(X, Y)`
`IF`
male(X) AND   [1]
parent(A, X)   AND   [1]
parent(A, Y)   [1]
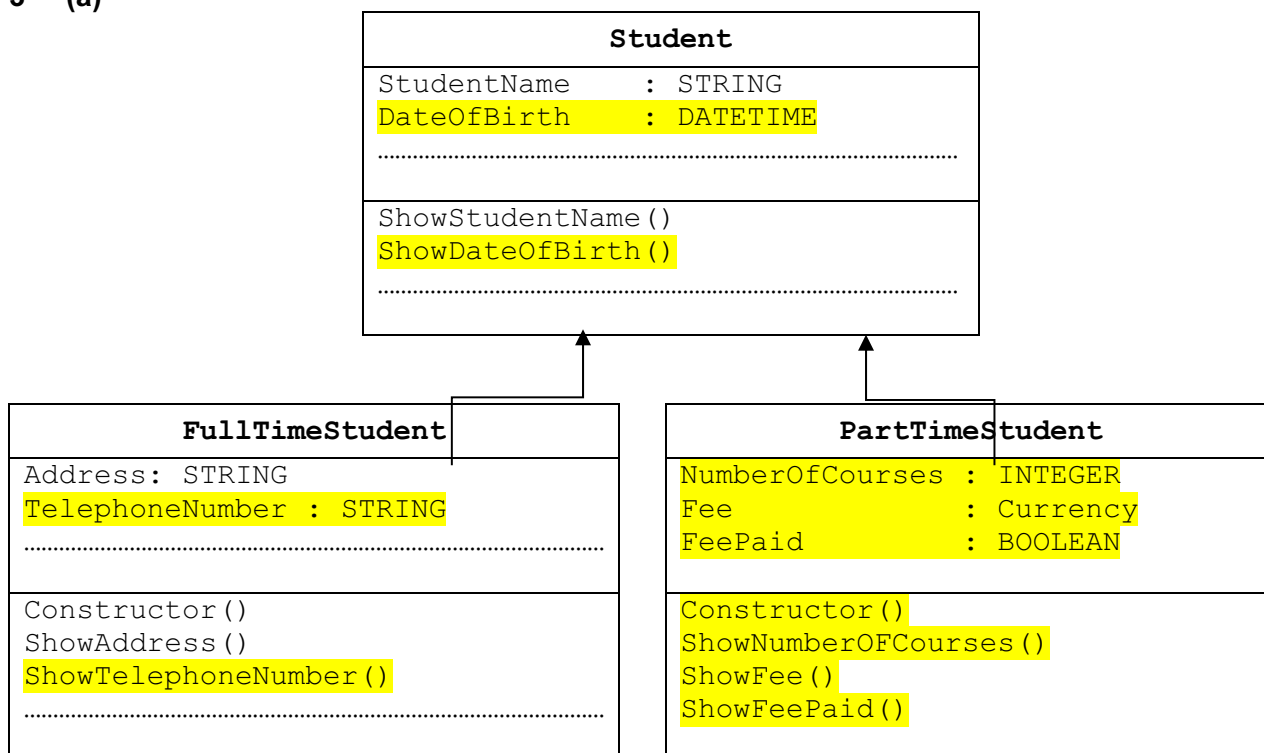**AND NOT X=Y.**   [1]

Accept any variable for A, but it must be the same in both places
Accept father/mother instead of parent
Ignore capitalisation

3 (a)

```
                        Student
        StudentName     : STRING
        DateOfBirth     : DATETIME
        .............................................................

        ShowStudentName()
        ShowDateOfBirth()
        .............................................................
```

```
       FullTimeStudent                        PartTimeStudent
   Address: STRING                      NumberOfCourses  :  INTEGER
   TelephoneNumber : STRING             Fee              :  Currency
   ................................     FeePaid          :  BOOLEAN

   Constructor()                        Constructor()
   ShowAddress()                        ShowNumberOFCourses()
   ShowTelephoneNumber()                ShowFee()
   ................................     ShowFeePaid()
```

Mark as follows:

Base class:
– dateOfBirth declaration and associated method in Student
– constructor
Subclasses:
– telephoneNumber declaration and associated method in FullTimeStudent
– NumberOFCourses declaration and associated method in PartTimeStudent
– fee declaration and associated method in PartTimeStudent
– feepaid declaration and associated method in PartTimeStudent
– constructor method in PartTimeStudent
– inheritance arrows

Ignore data types, ignore other methods/attributes
Ignore brackets after methods   [Max 7]

(b) (i) Mark as follows (parts to be ignored in grey):

If no programming language stated, map to 1 of the 3 below (or check in Q1ai)
Class header & ending (watch out these may be squashed into the next clip)
Ignore methods
2 attributes with correct data types
No mark if subclass properties shown here
Attributes required:
StudentName
DateOfBirth (accept variations e.g. DoB)

Pascal

```
TYPE Student = CLASS
    PUBLIC
        Procedure ShowStudentName();
        Procedure ShowDateOfBirth();
    PRIVATE
        StudentName : STRING;
        DateOfBirth : TDateTime;  // accept string    reject Date
END;
```

Python
```
class Student :
    def __int__(self) :
        self.__StudentName = ""
        self.__DateOfBirth = ""  # date(1,1,2015)
    def ShowStudentName() :
        pass
    def ShowDateOfBirth() :
        pass
```

Ignore __ before attributes

VB.NET
```
Class Student
    Public Sub ShowStudentName()
    End Sub
    Public Sub ShowDateOfBirth()
    End Sub
    Private StudentName As String
    Private DateOfBirth As Date     ' accept string
End Class
```

(Ignore: must inherit)
Ignore Private/protected/public
Don't give a mark if using DIM   [2]

(ii) Mark as follows:

– Class header and showing superclass
– Properties (Do not award this mark if properties from base class included here)
    Data types must be correct
– Methods (Do not award this mark if methods from base class included here)
    must show heading and ending of procedure/function declaration
    Ignore PUBLIC, PRIVATE

Pascal
```
TYPE FullTimeStudent = CLASS (Student)
   PUBLIC
      Procedure ShowAddress();
      Procedure ShowTelephoneNumber();
   PRIVATE
      Address         : STRING;
      TelephoneNumber : STRING; // reject integer
END;
```

Python
```
class FullTimeStudent(Student) :
    def __init__(self) :
        self.__Address = ""
        self.__TelephoneNumber = ""
    def ShowAddress() :
        pass
    def ShowTelephoneNumber() :
        pass
```

VB.NET
```
Class FullTimeStudent : Inherits Student
    Public Sub ShowAddress()
    End Sub
    Public Sub ShowTelephoneNumber()
    End Sub
    Private Address As String
    Private TelephoneNumber As String  ' reject integer
End Class
```

No mark if using `DIM`   [3]

(iii) 1 mark per statement to max 3
Missing string delimiters: penalise once
Accept use of constructor

Pascal
```
NewStudent := FullTimeStudent.Create;
NewStudent.StudentName := 'A.Nyone';
NewStudent.DateOfBirth := EncodeDate(1990, 11,12);//:=
'11/12/1990'
NewStudent.TelephoneNumber := '099111';
```

Alternative
```
NewStudent := FullTimeStudent.Create('A.Nyone', '12/11/1990',
'099111');
```

Python
```
NewStudent = FullTimeStudent()
NewStudent.StudentName = "A.Nyone"
NewStudent.DateOfBirth = "12/11/1990"
NewStudent.TelephoneNumber = "099111"
```

Alternative
```
NewStudent = FullTimeStudent('A.Nyone', '12/11/1990', '099111')
```

VB.NET
```
Dim NewStudent As FullTimeStudent = New FullTimeStudent()
NewStudent.StudentName = "A.Nyone"
NewStudent.DateOfBirth = #11/12/1990#
NewStudent.TelephoneNumber = "099111"
```

Alternative
```
Dim NewStudent As FullTimeStudent = New
FullTimeStudent("A.Nyone", "12/11/1990", "099111")
```
[Max 3]

4 (a)
```
FUNCTION Hash(Key : STRING) RETURNS INTEGER
    DECLARE Number : INTEGER
    Number ← ASCII(LEFTSTRING(Key,1))
    // Number ← ASCII(Key[1])
    Number ← Number – 64
    RETURN Number
    // Result ← Number   // Hash ← Number
ENDFUNCTION
```

Accept `ASC` instead of `ASCII`
Accept `LEFT` instead of `LEFTSTRING`
Key can be a different identifier but must be the same in both places   [5]

(b) (i)

```
                    Dictionary
            Index   Key              Value
            1
            2
            3       Computer         Rechner      }
            4       Disk             Platte       }
            5       Error            Fehler       }
            6       File             Datei        }
            7
            8
            :       :                :
            :       :
            1999
            2000
```

Ignore spelling mistakes
1 mark for 2 correct pairs entered in correct slots   [2]

(ii) Collision / synonym / space already occupied / same index in array
Overwrites previous key-value pair

reject error   [Max 2]

(iii) Create an overflow area
The `'home'` record has a pointer to others with the same key // linked list
OR
Store the overflow record at the next available address …
in sequence (= next available)
OR
Re-design the hash function …. // write a different/another algorithm
to generate a wider range of indexes // enlarging storage space // to create fewer
collisions   [2]

(iv) Mark as follows:

Check whether slot is empty:
```
IF Dictionary[Index,1] <>"" //  != '' //  > NULL  // >
NONE
```
If not: update index: `THEN Index ← <some value>`
...to find an __empty__ slot (loop / follow pointer / go to overflow area) reject FOR loop
Insert code between lines 20 and 30

```
21 WHILE Dictionary[Index,1] > ""
22    Index ← Index + 1
23    IF Index > 2000
24       THEN
25          Index ← 1
26    ENDIF
27 ENDWHILE
```
[4]

5 (a) (i)

Accumulator	Memory Address			
	509	510	511	512
0	7	3	0	0
7				7
0				
1			1	
7				
14				14
1				
2			2	
14				
21				21
2				
3			3	

3 marks   *1 mark*   *1 mark*

If values changed in column 509 or 510 don't give marks for 511/512   [5]

(ii) <u>stores</u> the counter value for ….// acts as a control variable/counter
How many times the loop has been performed // control the loop

Ignore re-stating the steps   [2]

(b) LDM   #12   (must be instruction before storage)
STO   509   (must be final instruction)

1 mark for each instruction   [2]

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6 **(a)** 1 mark for structure header/ending
1 mark for each field correct, take away 1 mark for additional fields
Python answers will use a class

Pascal
```
TYPE StockItem = RECORD
    ProductCode    : String;   // accept integer
    Price          : Currency; // accept real
    NumberInStock  : Integer;
END;
```

Python
```
class StockItem :
    def __init__(self) :
        self.ProductCode = ""     # = 0
        self.Price = 0.0          # = 0
        self.NumberInStock = 0
```

VB.NET
```
STRUCTURE StockItem
    Dim ProductCode As String    ' accept integer
    Dim Price As Decimal         ' Double/single
    Dim NumberInStock As Integer
END STRUCTURE
```

VB6
```
Type StockItem
    ProductCode As String    ' accept integer
    Price As Currency        ' Double/single
    NumberInStock As Integer
END Type
```
[4]

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(b) (i)
```
01 TRY
02     OPENFILE "StockFile" FOR READ/RANDOM   // ignore "
03 EXCEPT
04     OUTPUT "File does not exist"
05 ENDTRY
```
[2]

(ii) (Line 01) alerts system to check for possible <u>run-time</u> errors (exception)
(Lines 03, 04) handle the exception without the program crashing // keeps program running// provide alternative statements to execute to avoid <u>run-time</u> error

Accept "exception handling" for 1 mark   [Max 2]

(c)
```
WHILE NOT EOF("StockFile")
    READFILE "StockFile", ThisStockItem // accept reading separate
fields
    OUTPUT ThisStockItem.ProductCode
    OUTPUT ThisStockItem.NumberInStock
ENDWHILE
```

1 mark for loop (accept REPEAT)
1 mark for EOF("StockFile") // StockFile.Peek <> -1 / NONE/"
1 mark for READ record
1 mark for OUTPUT of 2 fields

Ignore opening and closing file   [4]

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