



Cambridge International Examinations
Cambridge International Advanced Level

COMPUTER SCIENCE

9608/43

Paper 4 Written Paper

October/November 2016

MARK SCHEME

Maximum Mark: 75

Published

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Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

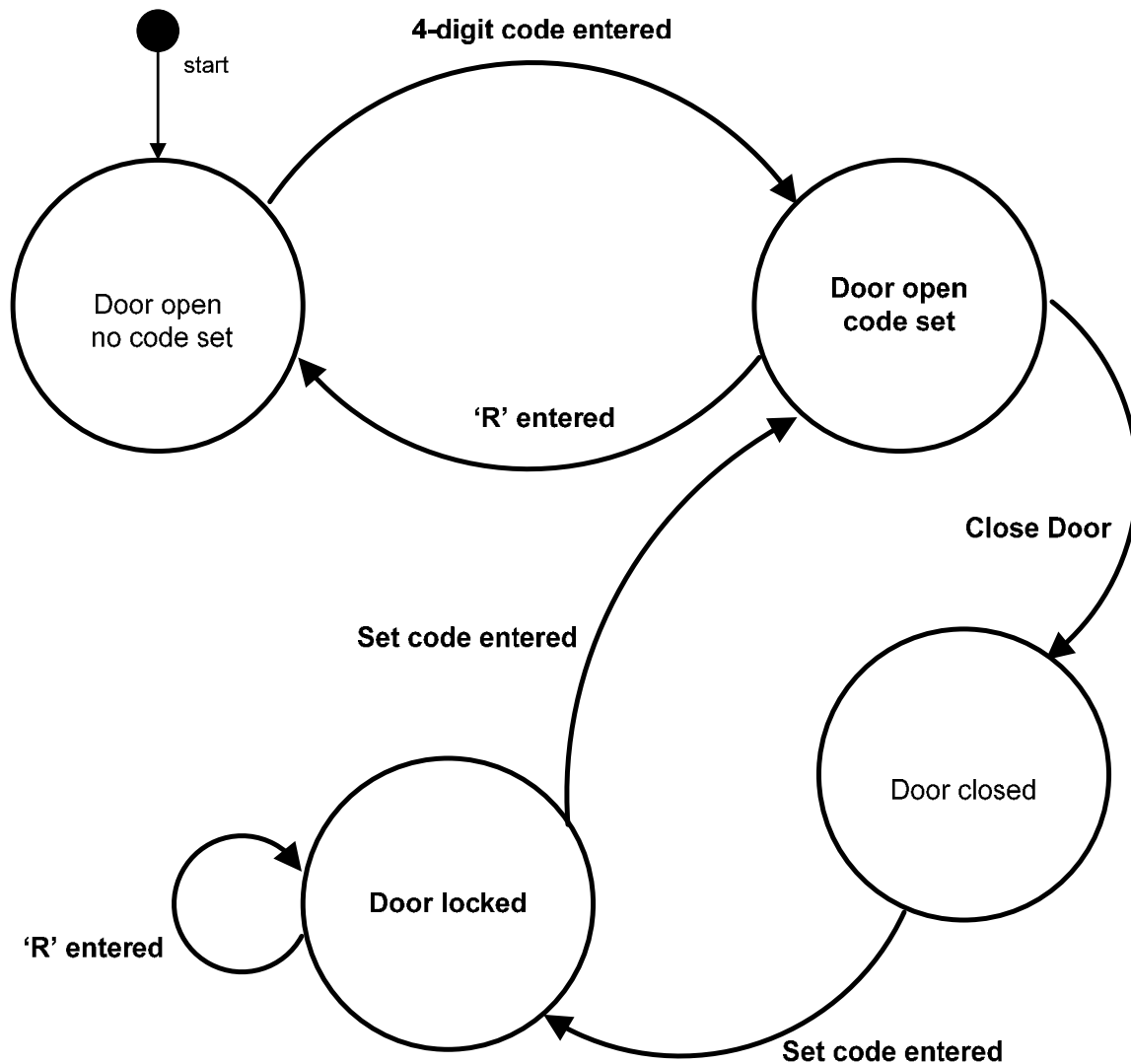
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1 (a) 1 mark for both Set code entered correct. 1 mark for each label.

[7]



(b) (i) 1 mark per bullet to max 3

[3]

- Method header
 - initialising Code to ""
 - initialising State to "Open-NoCode"
- e.g.

PYTHON:

```
def __init__(self):
    self.__code = ""
    self.__state = "Open-NoCode"
```

PASCAL/DELPHI:

```
constructor SafetyDepositBox.Create();
begin
    Code := '';
    State := 'Open-NoCode';
end;
```

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VB:

```
Public Sub New()
    Code = ""
    State = "Open-NoCode"
End Sub
```

(ii) 1 mark per bullet to max 2

[2]

- method header
 - Setting code to ""
- e.g.

PYTHON:

```
def reset(self):
    self.__code = ""
```

PASCAL/DELPHI:

```
procedure SafetyDepositBox.Reset();
begin
    Code := '';
end;
```

VB:

```
Public Sub Reset()
    Code = ""
End Sub
```

(iii) 1 mark per bullet to max 2

[2]

- method header with parameter
 - setting state to parameter value
 - Outputting state
- e.g.

PYTHON:

```
def SetState(self, NewState):
    self.__state = NewState
    print(self.__state)
```

PASCAL/DELPHI:

```
Procedure SetState(NewState : String);
begin
    State := NewState
    WriteLn(State)
end;
```

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VB:

```
Public Sub SetState(ByVal
NewState As String)
    State = NewState
    Console.WriteLine(State)
End Sub
```

VB:

```
Private _State As String
    Public Property State() As
String
        Get
            Return _State
        End Get
        Set(value As String)
            _State = value
        End Set
    End Property
Public Sub SetState()
    Console.WriteLine(Me.State)
End Sub
```

- (iv) 1 mark per bullet to max 2
- setting code to parameter
 - Outputting New cost set and code e.g.

[2]

PYTHON:

```
def SetNewCode(self, NewCode):
    self.__code = NewCode
    print("New code set: ", self.__code)
```

PASCAL/DELPHI:

```
procedure SetNewCode(NewCode : String);
begin
    Code := NewCode;
    WriteLn('New code set: ', Code)
end;
```

VB:

```
Public Sub SetNewCode(NewCode)
    Code = NewCode
    Console.WriteLine("New code set: " & Code)
End Sub
```

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(v) 1 mark per bullet to max 4

[4]

- function header taking string parameter, returns Boolean
- check length of string is 4
- check each character is a digit
- return of correct Boolean value for both cases
e.g

PYTHON:

```
def __valid(self, s):
    digits = ['0','1','2','3','4','5','6','7','8','9']
    isValid = False
    if (len(s) == 4):
        if (s[0] in digits) & (s[1] in digits) & (s[2] in digits) &
            (s[3] in digits):
            isValid = True
    return(isValid)
```

PASCAL/DELPHI:

```
function Valid(s : string) : Boolean;
var isValid : Boolean; i : integer;
begin
    isValid := False
    if Length(s) = 4
    then
        begin
            isValid := True;
            For i := 1 to 4 do
                if (s[i] < '0') OR (s[i] > '9')
                then
                    isValid := False;
            end;
        end;
end;
```

VB: *ByVal optional*

```
Public Function valid(ByVal s As String) As Boolean
    If s Like "####" Then
        Return True
    Else
        Return False
    End If
End Function
```

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(vi) 1 mark per bullet to max 12 [12]

- read Chars from keyboard
- check if 'R' and state = Open-CodeSet
 - call method Reset() & method SetState
- if Chars is the set code:
 - check if locked
 - set state to Open-CodeSet
 - else if closed
 - then set state to Locked
- if Chars is empty and State is "Open-CodeSet" then setState to closed
- if Chars is a valid 4-digit code and state is Open-NoCode
 - call setNewCode and SetState
- outputting correct error messages for not valid 4-digit and state is not Open-NoCode e.g.

PYTHON:

```
def StateChange(self):
    Chars = input("Enter code: ")
    if Chars == "R":
        if self.__state == "Open-CodeSet":
            self.reset()
            self.SetState("Open-NoCode")
        elif Chars == self.__code:
            if self.__state == "Locked":
                self.SetState("Open-CodeSet")
            elif self.__state == "Closed":
                self.SetState("Locked")
        elif (Chars == "")
            & (self.__state == "Open-CodeSet"):
                self.SetState("Closed")
        elif self.__valid(Chars):
            if self.__state == "Open-NoCode":
                self.SetNewCode(Chars)
                self.SetState("Open-CodeSet")
            else:
                print("Error - does not match set code")
        else:
            print("Error - Code format incorrect")
```

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PASCAL/DELPHI:

```

Procedure StateChange();
var Chars : String;
begin
    ReadLn(Chars);
    If Chars = 'R' Then
        If State = 'Open-CodeSet' Then
            begin
                Reset();
                SetState('Open-NoCode');
            end
        Else
            If Chars = Code Then
                If state = 'Locked' Then
                    SetState('Open-CodeSet')
                Else
                    If state = 'Closed' Then
                        SetState('Locked')
                    Else
                        If (Chars = '') AND (State = 'Open-CodeSet') Then
                            SetState('Closed')
                        Else
                            If Valid(Chars) Then
                                begin
                                    If State == 'Open-NoCode' Then
                                        begin
                                            SetNewCode(Chars);
                                            SetState('Open-CodeSet');
                                        end
                                    else
                                        WriteLn('Error - does not match set code')
                                    end
                                end
                            Else
                                WriteLn('Error - Code format incorrect');
                        end;
                    end
                end
            end
        end
    end;

```

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VB:

```
Public Sub StateChange()
    Dim Chars As String
    Chars = Console.ReadLine()
    If Chars = "R" Then
        If State = "Open-CodeSet" Then
            Reset()
            SetState("Open-NoCode")
        End If
    ElseIf Chars = Code Then
        If state = "Locked" Then
            SetState("Open-CodeSet")
        ElseIf state = "Closed" Then
            SetState("Locked")
        End If
    ElseIf (Chars = "") AND (State = "Open-CodeSet") Then
        SetState("Closed")
    ElseIf Valid(Chars) Then
        If State == "Open-NoCode" Then
            SetNewCode(Chars)
            SetState("Open-CodeSet")
        Else
            Console.WriteLine("Error - does not match set code")
        End If
    Else
        Console.WriteLine("Error - Code format incorrect")
    End If
End Sub
```

(vii) **1 mark per bullet to max 4**

[4]

- method header
 - Initialising ThisSafe to instance of SafetyDepositBox
 - Loop forever
 - Call method StateChange on ThisSafe
- e.g.

PYTHON:

```
def main():
    ThisSafe = SafetyDepositBox()
    while True:
        ThisSafe.StateChange()
```

PASCAL/DELPHI:

```
var ThisSafe : SafetyDepositBox;
ThisSafe := SafetyDepositBox.Create;
while True do
    ThisSafe.StateChange;
```


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VB:

```
Sub Main()
    Dim ThisSafe As New SafetyDepositBox()
    Do
        ThisSafe.StateChange()
    Loop
End Sub
```

- (c) (i) 1 mark per bullet to max 2: [2]
- The attributes can only be accessed in the class
 - Properties are needed to get/set the data // It provides/uses encapsulation
 - Increase security/integrity of attributes

- (ii) 1 mark per bullet [2]
- The public methods can be called anywhere in the main program // Public methods can be inherited by sub-classes
 - The private methods can only be called within the class definition // cannot be called outside the class definition // Private methods cannot be inherited by sub-classes

- 2 (a) (i) 1 mark per feature to max 3 [3]
e.g.

- auto-indent
 - auto-complete / by example
 - colour-coded keywords/ strings/ comments/ built-in functions/ user-defined function names
 - pop-up help
 - can set indent width
 - expand/collapse subroutines/code
 - block highlighting
- incorrect syntax highlighting/underlining //dynamic syntax checker

- (ii) Read and mark the answer as one paragraph. Mark a 'how' and a 'when' anywhere in the answer. [2]

1 mark for when, 1 mark for how.

e.g.

When:

- the error has been typed
- when the program is being run/compiled/interpreted

How:

- highlights/underlines
- displays error message/pop-up

(iii)

A	B	C
Line 3	Line 5	Line 4
while (Index == -1) & (Low <= High):	WHILE (Index = -1) AND (Low <= High) DO	DO WHILE (Index = - 1) AND (Low <= High)

[1]

[1]

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- (b) (i) Python: compiled/interpreted [1]
 VB.NET: compiled
 Pascal: compiled/interpreted
 Delphi: compiled/interpreted

(ii)

Logic error	Logic error	Logic error	[1]
11 return(Index)	14 Result := Index;	14 BinarySearch = Index	[1]

(iii) 1 mark for each name, 1 for each description [4]

- breakpoint
- a point where the program can be halted to see if the program works at this point
- stepping / step through
- executes one statement at a time and then pauses to see the effect of each statement
- variable watch window
- observe how variables changed during execution

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START:	LDR	#0	// initialise index register to zero	[1]
	LDM	#0	// initialise COUNT to zero	[1]
	STO	COUNT		
LOOP1:	LDX	NAME	// load character from indexed address NAME	[1]
	OUT		// output character to screen	[1]
	INC	IX	// increment index register	[1]
	LDD	COUNT	// increment COUNT starts here	
	INC	ACC		[1]
	STO	COUNT		
	CMP	MAX	// is COUNT = MAX?	[1]
	JPN	LOOP1	// if FALSE, jump to LOOP1	[1]
REVERSE:	DEC	IX	// decrement index register	[1]
	LDM	#0	// set ACC to zero	[1]
	STO	COUNT	// store in COUNT	
LOOP2:	LDX	NAME	// load character from indexed address NAME	[1]
	OUT		// output character to screen	
	DEC	IX	// decrement index register	[1]
	LDD	COUNT	// increment COUNT starts here	
	INC	ACC	//	[1]
	STO	COUNT	//	
	CMP	MAX	// is COUNT = MAX?	[1]
	JPN	LOOP2	// if FALSE, jump to LOOP2	
	END		// end of program	[1]
COUNT:				
MAX:	4			
NAME:	B01000110		// ASCII code in binary for 'F'	
	B01010010		// ASCII code in binary for 'R'	
	B01000101		// ASCII code in binary for 'E'	
	B01000100		// ASCII code in binary for 'D'	

[Max 15]

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4

	Acceptance testing	Integration testing	
Who	The end user // user of the software	The programmer / in-house testers	[1] + [1]
When	When the software is finished/ when it is installed	When the separate modules have been written and tested	[1] + [1]
Purpose	To ensure the software is what the customer ordered // to check that the software meets the user requirements	To ensure the modules work together as expected	[1] + [1]