Cambridge International A Level

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COMPUTER SCIENCE **9608/41**

Paper 4 Written Paper **October/November 2016**

MARK SCHEME

Maximum Mark: 75

Published

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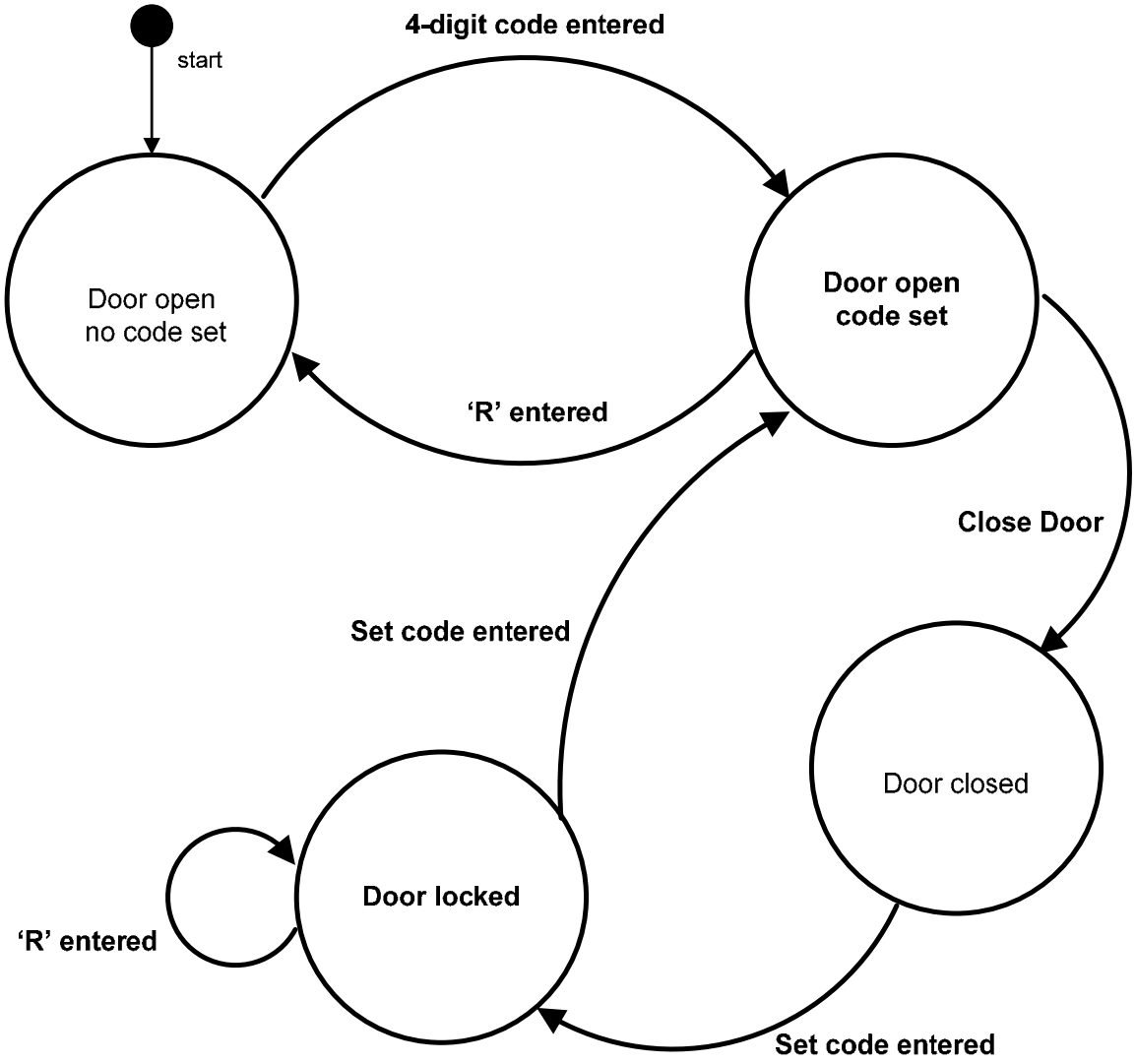
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1 **(a)** 1 mark for both Set code entered correct. 1 mark for each label. **[7]**



(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 **[2]**

- setting code to <u>parameter</u>
- Outputting New cost set and code

e.g.

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;
```

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
   Else
      WriteLn('Error - Code format incorrect');
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	**[1]**
`while (Index == -1) & (Low <= High):`	`WHILE (Index = -1) AND (Low <= High) DO`	`DO WHILE (Index = -1) AND (Low <= High)`	**[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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	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]**

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