Cambridge International A Level

**Cambridge International Examinations**
Cambridge International Advanced Level

**COMPUTER SCIENCE** **9608/42**

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

MARK SCHEME

Maximum Mark: 75

**Published**

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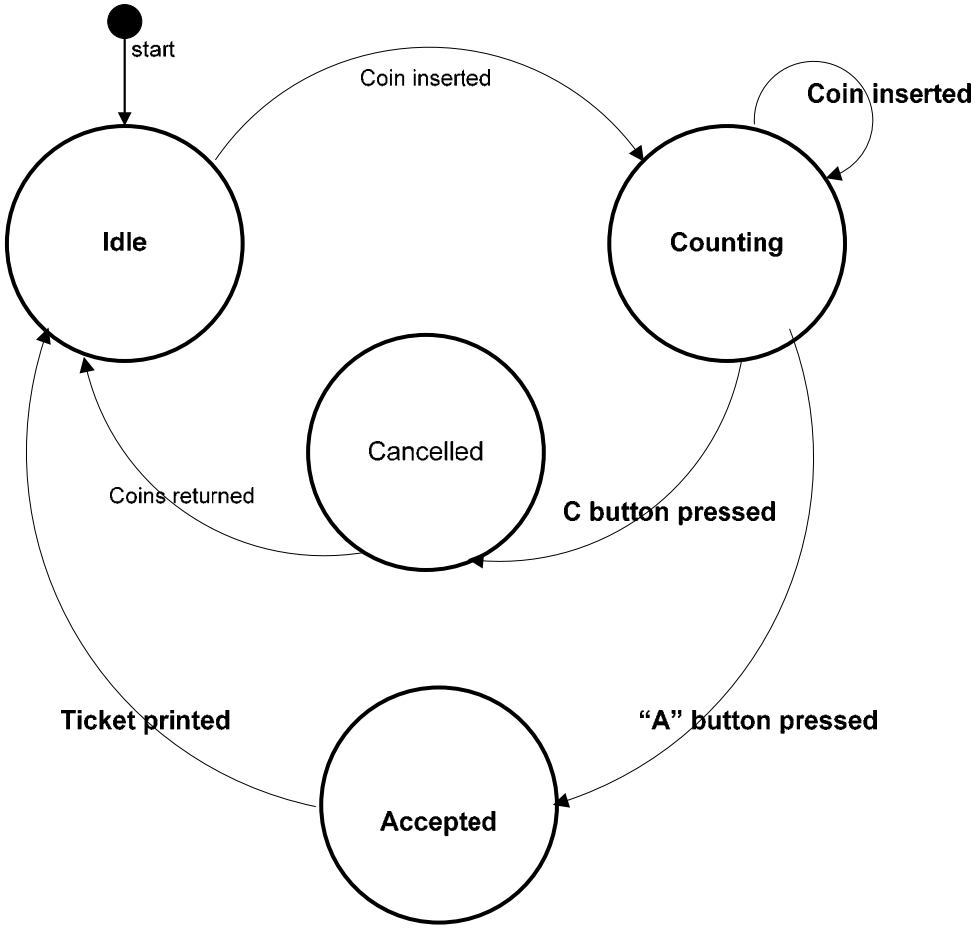
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**1 (a)** [7]




1 mark for each label

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**(b) (i) 1 mark per bullet to max 3:** [3]

- method header and close
- initialising amount to 0
- initialising state to “Idle”

e.g.

PYTHON:
```
def __init__(self):
    self.__amount = 0
    self.__state = "Idle"
```

PASCAL/DELPHI:
```
constructor TicketMachine.Create();
begin
    Amount := 0;
    State := 'Idle';
end;
```

VB:
```
Public Sub New()
    Amount = 0
    State = "Idle"
End Sub
```

VB:
```
Public Sub Create()
    Amount = 0
    state = “Idle”
End Sub
```

**(ii)** 1 mark per bullet to max 2: [2]

- method header, close 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 TicketMachine.SetState(NewState : string);
begin
    State := NewState;
    Writeln(State);
end;
```

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```
VB:
Public Sub SetState(NewState As
String)
   Me.State = NewState
   Console.WriteLine(Me.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
```

**(iii) 1 mark per bullet to max 2:** [2]

- output Amount
- set amount to zero

e.g.

PYTHON:

```
   def ReturnCoins(self):
      print(self.__Amount)
      self.__Amount = 0
```

PASCAL/DELPHI:

```
procedure TicketMachine.ReturnCoins();
begin
   Writeln(Amount);
   Amount := 0;
end;
```

VB:

```
Public Sub ReturnCoins()
   Console.WriteLine(Me.Amount)
   Me.Amount = 0
End Sub
```

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**(iv) 1 mark per bullet to max 3:** [3]

- function header, take string as parameter, return Boolean
- check the parameter is a valid coin
- return of value for both cases

e.g.

PYTHON:

```
def __validCoin(self, s):
    coins = ['10','20','50','100']
    if s in coins:
        isValid = True
    else:
        isValid = False
    return(isValid)
```

PASCAL/DELPHI:

```
function TicketMachine.ValidCoin(s : string) : boolean;
begin
    if ((s = '10') or (s = '20') or (s = '50') or (s = '100'))
then
        ValidCoin:= True;
    else
        ValidCoin := False;
end;
```

VB:

```
Public Function ValidCoin(ByVal s As String) As Boolean
    If s = “10” or s = “20” or s = “50” or s = “100” Then
        ValidCoin = True
    Else
        ValidCoin = False
    End If
End Sub
```

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**(v)** 1 mark per bullet to max 2 [2]

- Cast parameter as integer
- Add value to amount

e.g.

PYTHON:

```
   def coinInserted(self, s):
      coinValue = int(s)
      self.__amount = self.__amount + coinValue
```

PASCAL/DELPHI:

```
procedure TicketMachine.CoinInserted(s : string);
var
   CoinValue, Code : integer;
begin
   Val(s, CoinValue, Code);
   Amount := Amount + CoinValue;
end;
```

VB:

```
Public Sub CoinInserted(ByVal S As String)
   CoinValue = INT(s)
   Me.Amount = Me.Amount + CoinValue
End Sub
```

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

- read NewInput from keyboard
- check if input 'C' and state = Counting
  - then set state to cancelled
  - call method returnCoins() and set state to Idle
- check if input 'A'
  - then check if amount = 0 then output no coins
  - else set state to Accepted
  - call PrintTicket method and Set state to Idle
- else if input is a valid coin
  - call CoinInserted method with NewInput as parameter
  - set state to Counting
  - error message if not a valid coin

e.g.

PYTHON:

```
def stateChange(self):
    newInput = input("Insert coin: ")
    if newInput == "C":
        if self.__state == "Counting":
            self.setState("Cancelled")
            self.returnCoins()
        self.setState("Idle")
    elif newInput == "A":
        if self.__amount == 0:
            print("no coins inserted")
        else:
            self.setState("Accepted")
            self.__PrintTicket()
        self.setState("Idle")
    elif self.__validCoin(newInput):
        self.coinInserted(newInput)
        self.setState("Counting")
    else:
        print("Error - not a valid coin")
```

PASCAL/DELPHI:

```
procedure TicketMachine.StateChange();
var
   NewInput : string;
begin
   Write('Insert coin: ');
   Readln(NewInput);
   if (NewInput = 'C') then
   begin
      if (State = 'Counting') then
      begin
         State := 'Cancelled';
         ReturnCoins();
      end;
      SetState('Idle')
   end
   else
      if (NewInput = 'A') then
```

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```
        begin
           if (Amount = 0) then
              Writeln('No coins inserted')
           else
           begin
              SetState('Accepted');
              PrintTicket();
           end;
           SetState('Idle');
        end
        else
           if (ValidCoin(NewInput)) then
           begin
              CoinInserted(NewInput);
              SetState('Counting')
           end
        else
           Writeln('Error - not a valid coin')
end;
```

VB:

```
Public Sub StateChange()
   Dim NewInput As String
   NewInput = Console.Readline()
   If NewInput = “C” Then
      If State = “Counting” Then
         SetState(“Cancelled”)
         ReturnCoins()
      End If
      SetState(“Idle”)
   Elseif NewInput = “A” Then
      If Amount = 0 Then
         Console.Writeline(“No coins inserted”)
      Else
         SetState(“Accepted”)
         PrintTicket()
      Endif
         SetState(“Idle”)
      Elseif ValidCoin(NewInput) Then
         CoinInserted(NewInput)
         SetState(“Counting”)
      Else
         Console.Writeline(“Error – not a valid coin”)
      EndIf
End Sub
```

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

- declaration of main method header
- Initialising ParkingMeter as instance of TicketMachine
- Looping while true/until false
  - Calling stateChange method on ParkingMeter

e.g.

PYTHON:

```
def main():
   ParkingMeter = TicketMachine()
   while True:
      ParkingMeter.stateChange()
```

PASCAL/DELPHI:

```
begin
   ParkingMeter := TicketMachine.Create();
   while True do
      ParkingMeter.StateChange();
end.
```

VB:

```
Sub Main()
   Dim ParkingMeter As New TicketMachine
   ParkingMeter.Create()
   While (True)
      Call ParkingMeter.StateChange()
   End While
End Sub
```

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**(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** [6]

| | **(i) Alpha testing** | **(ii) Beta testing** |
|---|---|---|
| **Who** | In house testers / developers / programmers | (potential) (end) user(s)/client(s) |
| **When** | Near the end of development // program is nearly fully-usable // after integration and before beta | Before general release of software // passed Alpha testing |
| **Purpose** | To find errors not found in earlier testing // ensure ready for beta testing | For constructive comments/ feedback // to test in real-life scenarios/situations/ environments // ensure it is ready for release // ensure it meets users' needs |

**3 (a) (i)** 1 mark per bullet to max 2: [2]

- `11011111`
- `AND`

**(ii)** 1 mark per bullet to max 2: [2]

- `00100000`
- `OR`

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**(b)** 1 mark per line

| | | | | |
|---|---|---|---|---|
| START: | LDR | #0 | // initialise index register to zero | 1 |
| | LDX | WORD | // get first character of WORD | 1 |
| | AND | MASK1 | // ensure it is in upper case using MASK1 | 1 |
| | OUT | | // output character to screen | |
| | INC | IX | // increment index register | 1 |
| | LDM | #1 | // load 1 into ACC | 1 |
| | STO | COUNT | // store in COUNT | 1 |
| LOOP: | LDX | WORD | // load next character from indexed address WORD | 1 |
| | OR | MASK2 | // make lower case using MASK2 | 1 |
| | OUT | | // output character to screen | |
| | LDD | COUNT | // increment COUNT | 1 |
| | INC | ACC | // | |
| | STO | COUNT | // | |
| | CMP | LENGTH | // is COUNT = LENGTH? | 1 |
| | JPN | LOOP | // if FALSE – jump to LOOP | 1 |
| | END | | // end of program | 1 |
| COUNT: | 0 | | | |
| MASK1: | B11011111 | | // bit pattern for upper case | 1 |
| MASK2: | B00100000 | | // bit pattern for lower case | |
| LENGTH: | 4 | | | |
| WORD: | B01100110 | | //ASCII code in binary for 'f' | |
| | B01101000 | | //ASCII code in binary for 'r' | |
| | B01000101 | | //ASCII code in binary for 'E' | |
| | B01000100 | | //ASCII code in binary for 'D' | |

[max 12]

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**4 (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.
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)** 1 mark for identifying the correct line, 1 mark for writing the corrected line

| **A** - Line 5 | **B** - Line 6 | **C** - Line 5 | [1] |
|---|---|---|---|
| `for i in range(Max-1):` | `FOR i := 1 TO (Max-1) DO` | `For i = 0 To (Max – 1)` | [1] |

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

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**(ii)** 1 mark for naming error, 1 mark for line number and correction

| **A** Logic error | **B** Logic error | **C** Logic error | [1] |
|---|---|---|---|
| `7`<br>`NoMoreSwaps = False` | `10`<br>`NoMoreSwaps := FALSE;` | `7`<br>`NoMoreSwaps = False` | [1] |

**(iii)** 1 mark for naming, 1 for 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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