COMPUTER SCIENCE **9608/42**

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

MARK SCHEME

Maximum Mark: 75

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.
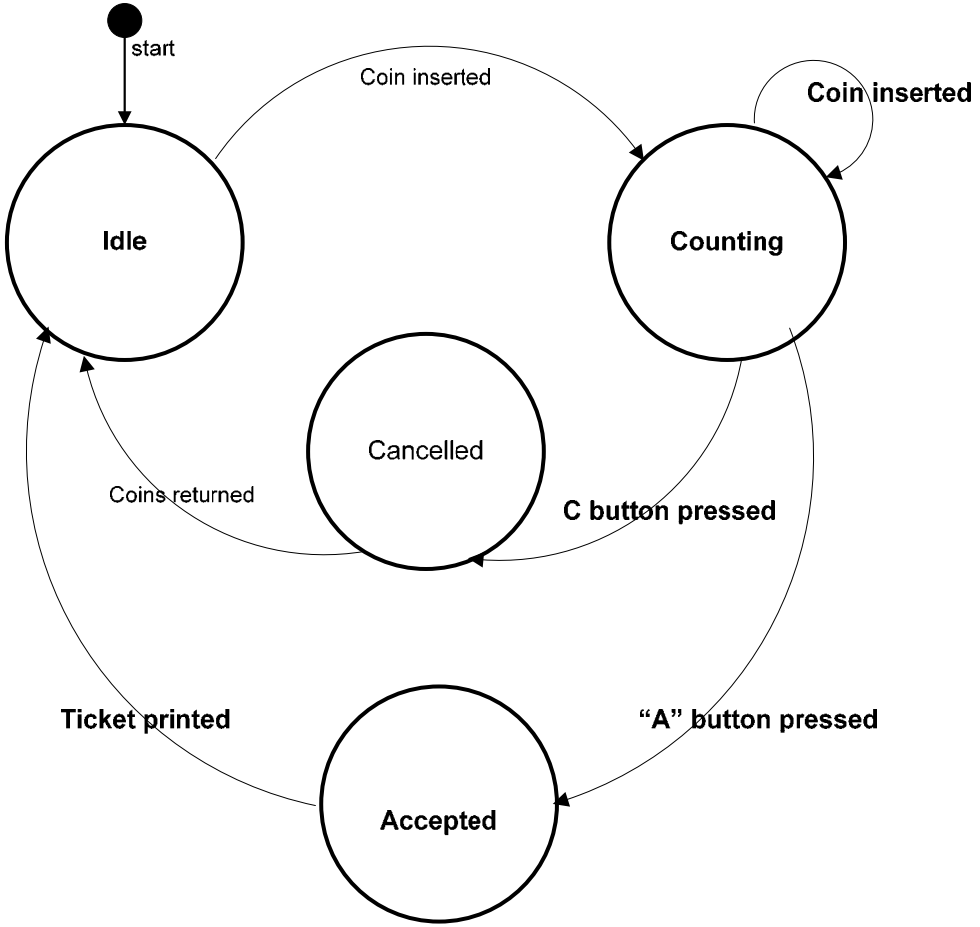
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1 (a) [7]

1 mark for each label

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

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
```

(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
```

(v) 1 mark per bullet to max 2   [2]
- Cast <u>parameter</u> 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
```

(vi) **1 mark per bullet to max 12** [12]
- read <u>NewInput</u> from keyboard
- check if input 'C' and state = Counting
  - o then set state to cancelled
  - o call method returnCoins() and set state to Idle
- check if input 'A'
  - o then check if amount = 0 then output no coins
  - o else set state to Accepted
  - o call PrintTicket method and Set state to Idle
- else if input is a valid coin
  - o call CoinInserted method with NewInput as parameter
  - o set state to Counting
  - o 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
```

```
                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
```

(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
```

(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 <u>integration</u> and before <u>beta</u>	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`

(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	
	INC	ACC	//	1
	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]

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 // <u>dynamic</u> 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

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

A Logic error	**B** Logic error	**C** Logic error	[1]
7 NoMoreSwaps = <mark>False</mark>	10 NoMoreSwaps := <mark>FALSE</mark>;	7 NoMoreSwaps = <mark>False</mark>	[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