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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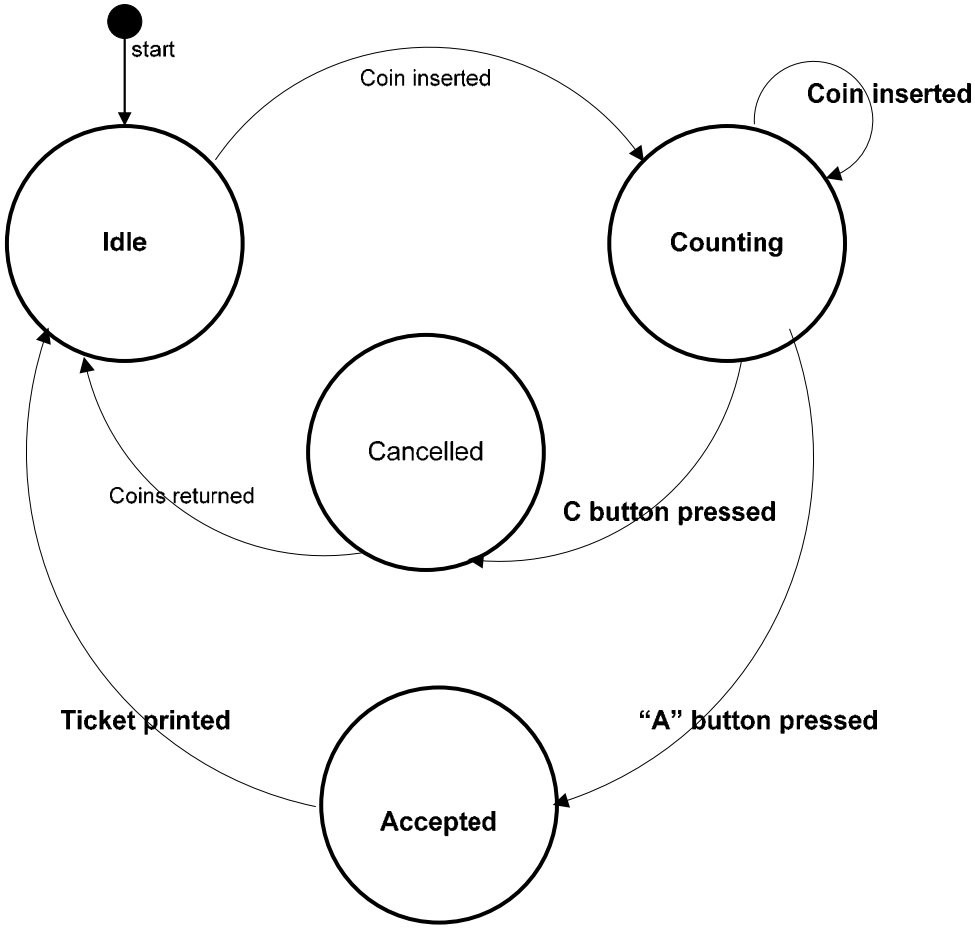
1 (a) [7]



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:
```
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;
```

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 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
```

(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
```

```
        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 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`

(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]

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

(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 = False`	`10` `NoMoreSwaps := FALSE;`	`7` `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