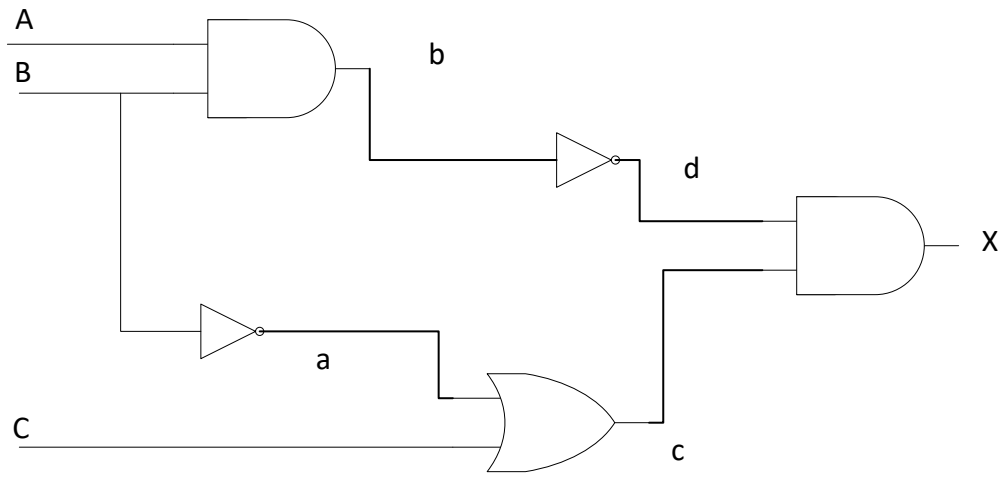
2020 Paper 2 Marking Scheme

Section A

1. (A) Use a spreadsheet of your choice to simulate he following logic of the worksheet. [5]

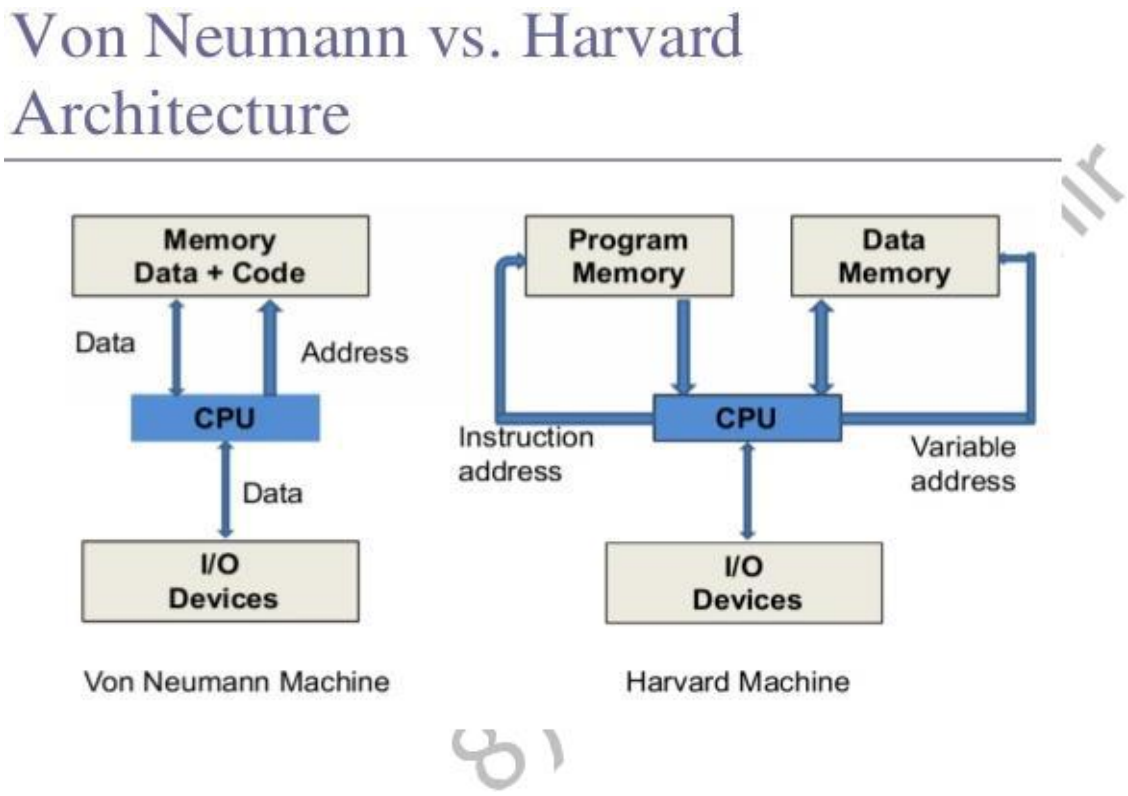


1				
	=AND(A1;A4)*1			
		=NOT(B2)*1		
1				
	=NOT(A4)*1			=AND(C3;D7)*1
			=OR(B5;A8)*1	
1				

	A	B	C	D	E	F
1	1					
2		TRUE				
3			FALSE			
4	1					
5		FALSE			FALSE	
6						
7				TRUE		
8	1					

(b) Draw the Von Neuman and Harvard architecture explaining the differences. [7]

Justify your answer to which architecture is the best to adopt.



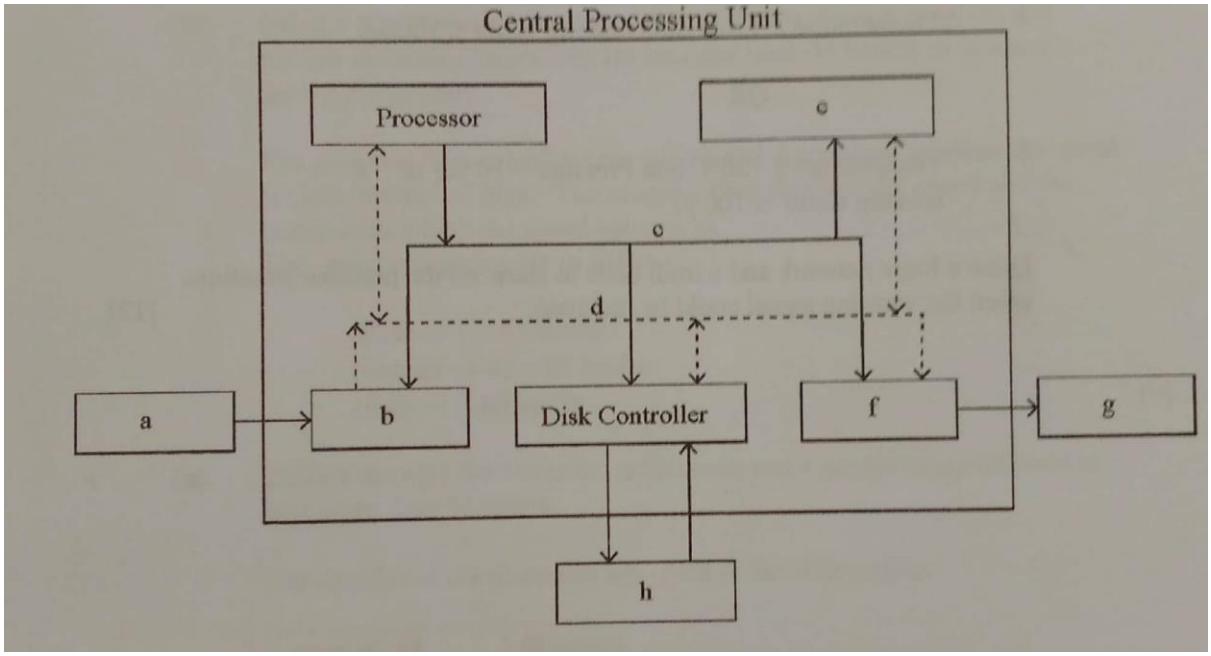
Harvard architecture

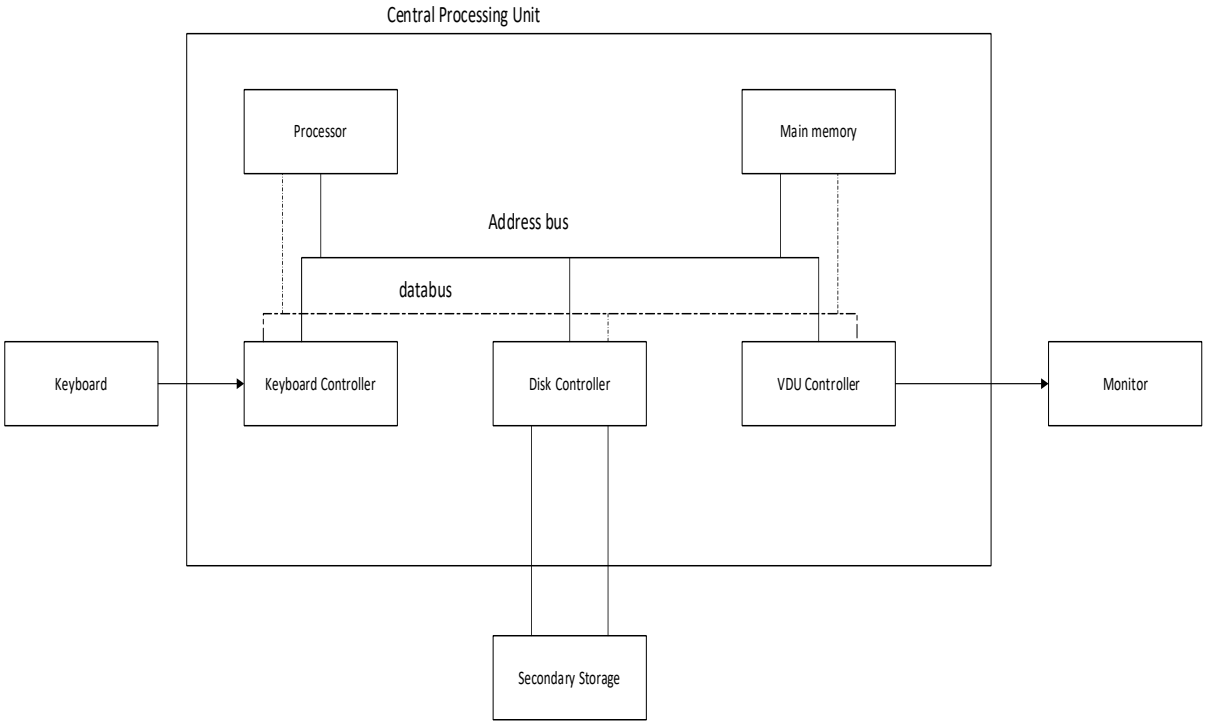
- *Stores instructions and data in separate memory, thus has physically separate storage for data and instructions*
- *Has a separate data and instruction bus, allowing transfers to be performed simultaneously on both buses.*
- *Data and instructions are treated separately*
- *Uses pipelining whereby Operand Fetch and Instruction Fetch can be overlapped.*
- *Harvard Architecture would have separate caches for each bus.*

(c) Some of the components of a computer system are:

Perpherals	-	keyboard
- Monitor		
I/O Ports	-	VDU controller
		Keyboard Controller
Memory	-	Main Memory
		Secondary Storage
System Buses	-	Data Bus
- Address bus		

Draw the diagram below and label the components using the list above. [8]





2. (a) A retail store in Mutare wants to buy an accounting application package which will assist in carrying out daily store operations. The operations include taking product stock, capturing sold products and printing reports for managerial staff

   As a system developer, design a suitable architecture for the mentioned requirements using an appropriate design tool. [8]

(b) A power station has a safety system based on **three** inputs to a logic network. A warning signal (s = 1) is produced when certain conditions occur based on these three inputs described in the table below.

Input	Binary value	Plant status
T	1	Temperature >120℃
	0	Temperature ≤ 120℃
P	1	Pressure > 10 bar
	0	Pressure ≤ 10 bar
W	1	Cooling water > 100/hr
	0	Cooling water ≤ 100/hr

A warning signal (s = 1) will be generated if either:

- Temperature >120℃ and cooling water ≤ 100/hr

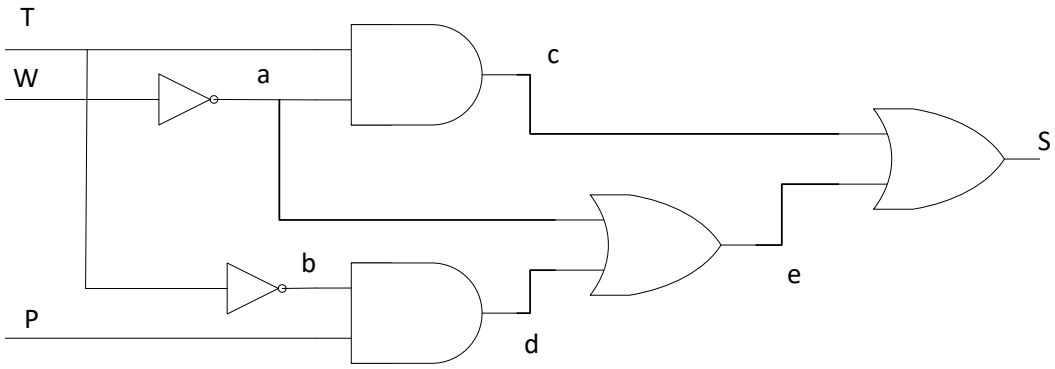
OR

- Temperature ≤ 120℃ and Pressure > 10 bar or

  Cooling water ≤ 100/hr

Draw a logic network and a truth table to show all the possible situations when the warning signal could be received. [12]

S = 1 If (T . W') + ((T' . P) +(W'))



T	*W*	*P*	*a*	*b*	*c*	*d*	*e*	*S*
0	*0*	*0*	*1*	*1*	*0*	*0*	*1*	*1*
0	*0*	*1*	*1*	*1*	*0*	*1*	*1*	*1*
0	*1*	*0*	*0*	*1*	*0*	*0*	*0*	*0*
0	*1*	*1*	*0*	*1*	*0*	*1*	*1*	*1*
1	*0*	*0*	*1*	*0*	*1*	*0*	*1*	*1*
1	*0*	*1*	*1*	*0*	*1*	*0*	*1*	*1*
1	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*
1	*1*	*1*	*0*	*0*	*0*	*0*	*0*	*0*

Section B

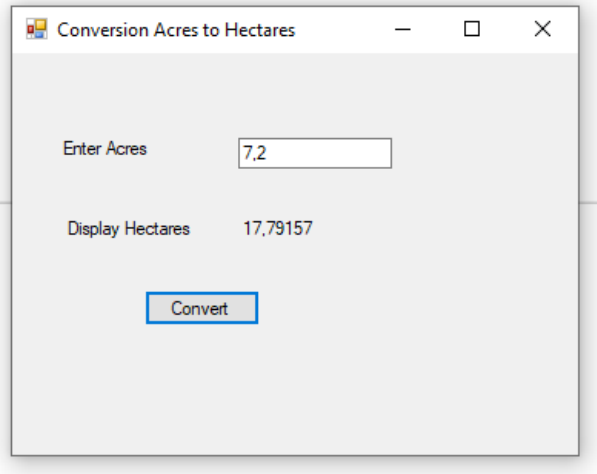
3. (a) Write an algorithm in pseudocode to calculate the average of a set of 5 marks for 10 students entered through the keyboard [8]

Start
Sum = 0
    For StudentCount = 1 to 10
    Enter Student Name
        For MarkCount = 1 to 5
        Enter mark
        Sum = sum + mark
        Next Markcount
    Average = sum/5
    Display Average
    Next StudentCount
Stop

(b) Design an interface and write a program to convert ares to hectares.
[1 are = 0.404686 hectares]
The program should accept input from the user and display the output
The program should work for real numbers as well as whole numbers
(e.g is should accept 7.2 acres, 0.5 acres etc) [8]

```
Public Class Form1

    Private Sub btnConvert_Click(ByVal sender As System.Object, ByVal e As System.
        Dim acres, hectares As Single
        acres = txtAcres.Text
        hectares = acres / 0.404686
        lblHectares.Text = hectares
    End Sub
End Class
```



(c) By using the bubble sort algorithm, write a code to sort an integer array of 10(ten) elements in ascending order [25]

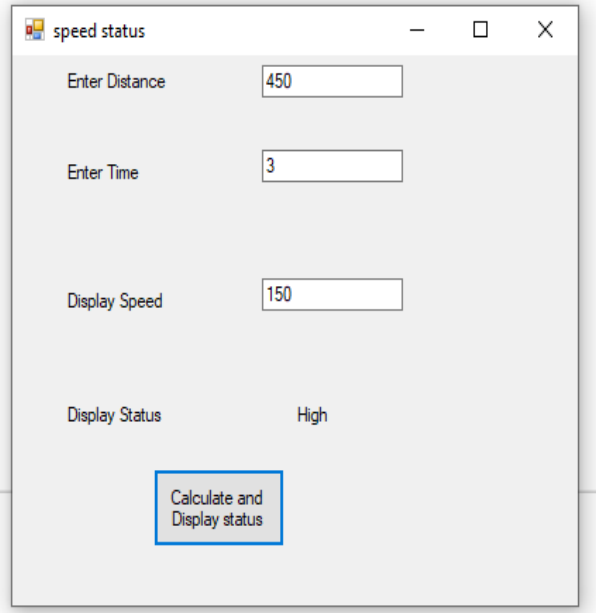
(a) Using programming language of your choice, write a program that accepts distance of a journey (in km) and time (in hours) to be spent during the journey
The program the calculates the speed; and determines whether the speed is slow, normal or high. The program then displays the speed and the category in which the speed belongs to.
The speed categories are as follows

Slow:	1 – 45 km/hr
Normal:	45 – 80 km/hr
High:	> 80 km/hr

[9]

```
Public Class Form1

    Private Sub btncalculate_Click(ByVal sender As System.Object, ByVal e As System.EventArgs)
        Dim speed, time, distance As Single
        distance = Txtdistance.Text
        time = txtime.Text
        speed = distance / time
        txtspeed.Text = speed
        If speed >= 80 Then
            lblstatus.Text = "High"
        ElseIf speed >= 45 Then
            lblstatus.Text = "Normal"
        ElseIf speed > 1 Then
            lblstatus.Text = "Slow"
        End If
    End Sub
End Class
```

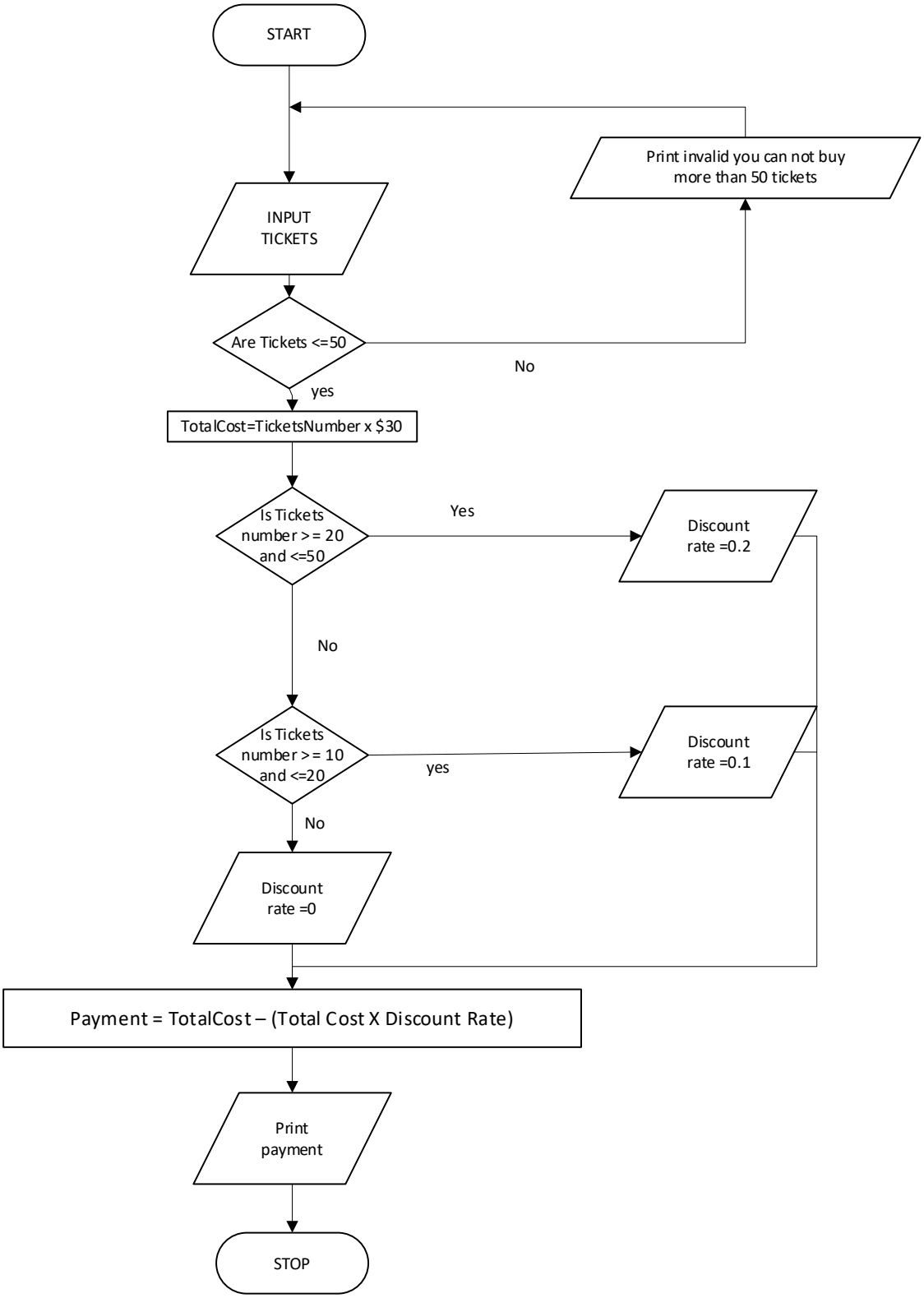


4. (a) Tickets are sold for a concert at $30 each and a person is not allowed to buy more than 50 tickets

The details for the discounts are given in the table below.

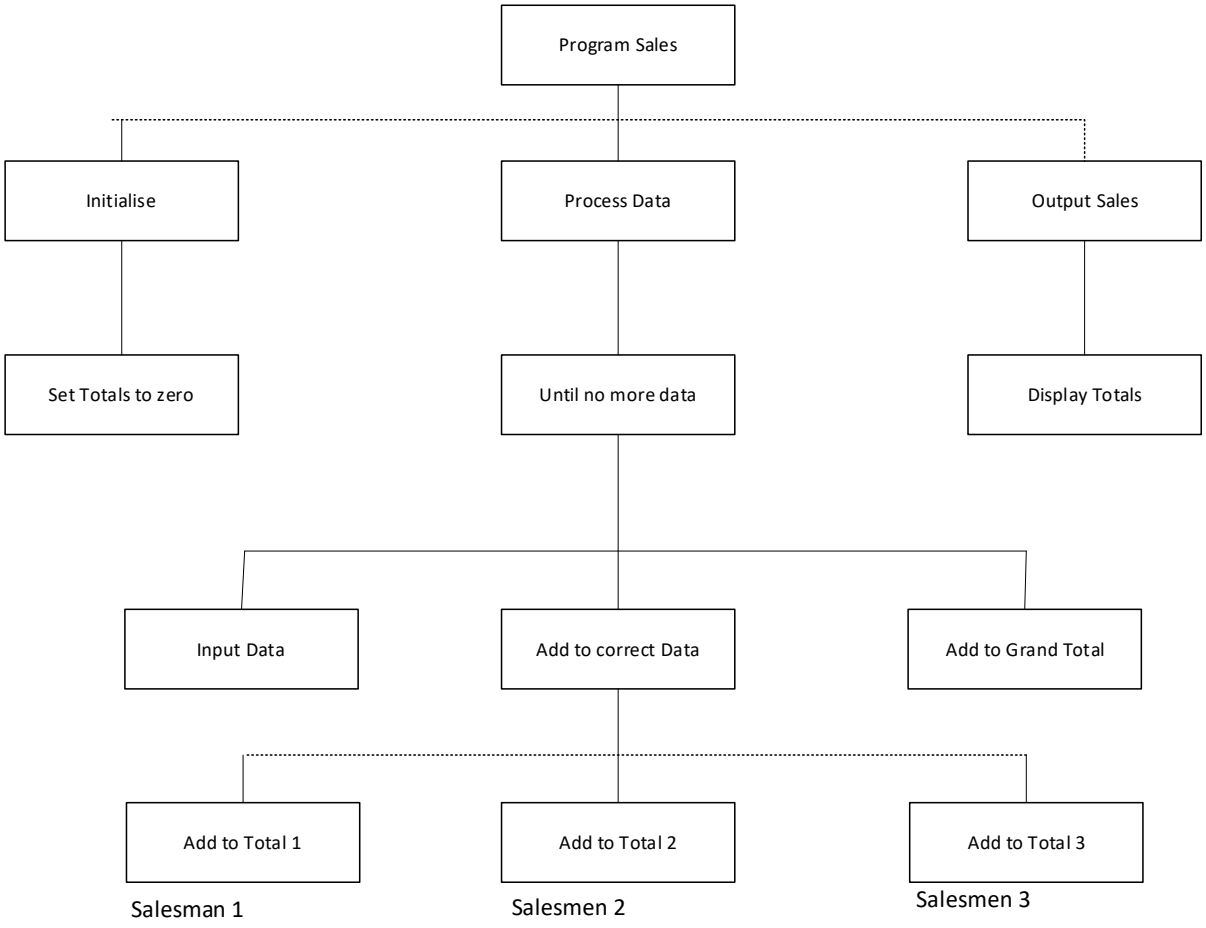
Number of tickets	discount
10-20	10%
21-50	20%

Draw a flowchart of a program that accepts the number of tickets, calculates discount and displays the total cost of the tickets [12]



(b) A program accepts total amount of daily sales transactions for three salespersons, accumulates the total sales for each salesperson and the grand total of all the sales. The program then outputs salesperson number, total sales per salesperson and the grand total.

(i) Draw a structure diagram to illustrate the program. [13]



(ii) write a program for the scenario described [25]

Section C

5.