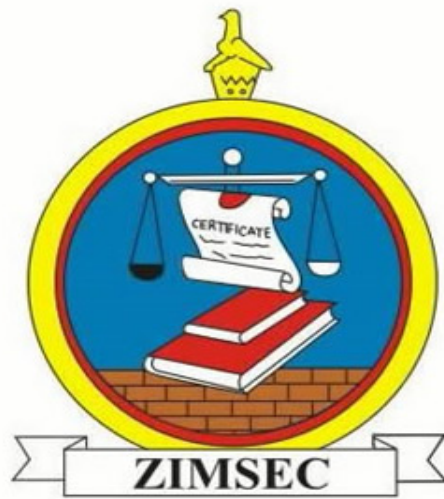




For Performance Measurement

PAPER1

N21 COMPUTER SCIENCE PAPER 1

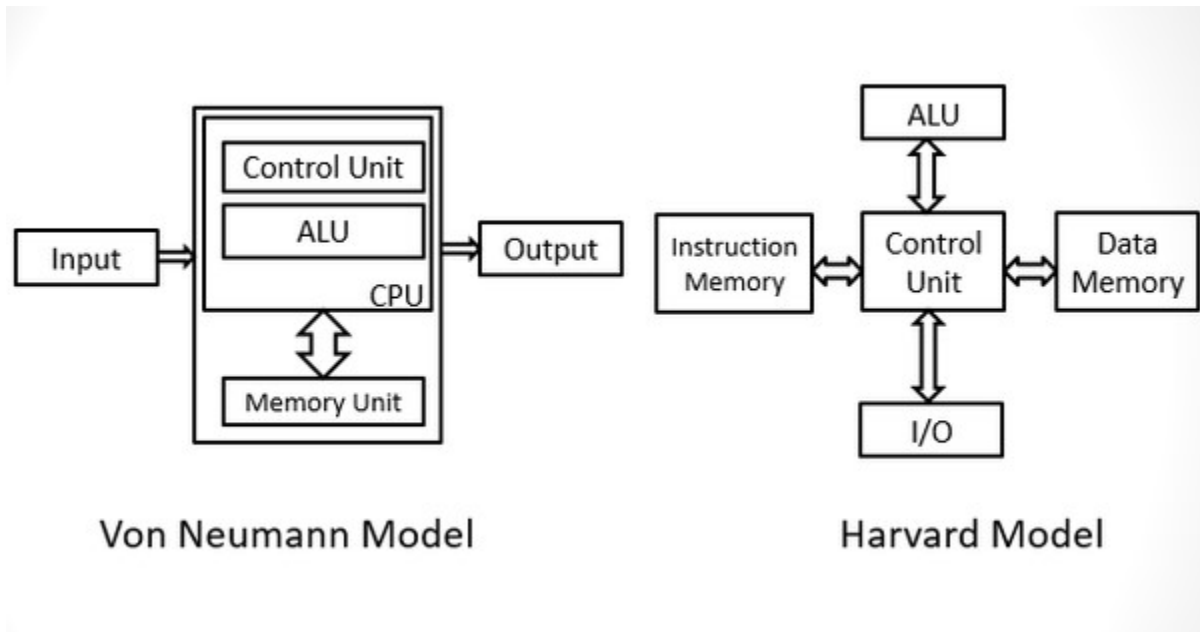
Compiled By [Cyberwave](#) Gods Own

.....Proverbs 16:3

2021 Suggested Solutions | Gods Own Cyberwave

1 (a) Illustrate using diagrams the difference between the Von Neumann Architecture and the Harvard Architecture.

[6]



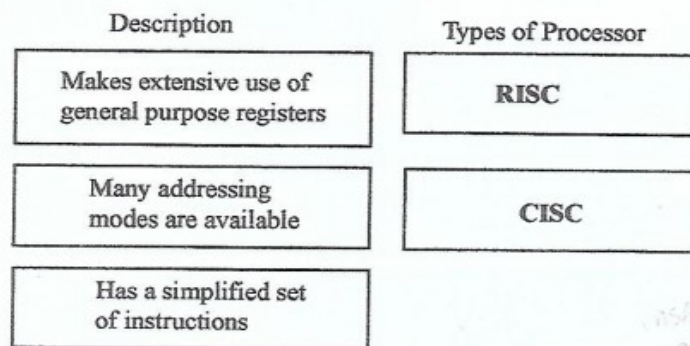
The major difference between the two architectures is that in a Von Neumann architecture all memory is capable of storing all program elements, data, and instructions; in a Harvard architecture, the memory is divided into two memories, one for data and one for instructions. In both these architectures, two different ways are used by which memory is accessed by the CPU

(b) Name any four components of the CPU. *

[4]

- Arithmetic Logic Unit(ALU)
- Control Unit(CU)
- Registers
- Cache Memory

- 2 (a) Three descriptions and two types of processor are given below. Link each description to the appropriate type of processor.



[3]

Makes extensive use of general purpose registers	RISC
Many addressing modes are available	CISC
Has a simplified set of instructions	RISC

The following table shows the five stages that occur when instructions are fetched and executed.

Stage	Time Interval								
	1	2	3	4	5	6	7	8	9
Fetch Instruction	A								
Decode Instruction									
Execute Instruction									
Access operand in Memory									
Write result to register									

- (i) The 'A' in the table indicates that instruction A has been fetched in time interval 1. Copy and complete the table to show the interval in which each stage of each instruction (A, B and C) is carried out.

[4]

Stage	1	2	3	4	5	6	7	8	9
Fetch Instruction	A	B	C						
Decode Instruction			A	B	C				
Execute Instruction					A	B	C		
Access Operand in Memory							A	B	C

3	(a)	Convert the following hexadecimal numbers to their decimal equivalent. Show the calculations.	
	(i)	20B3	[3]
	(ii)	12AE5	[3]

i)20B3

Case 1

	8192	0	176	3
Result	2×4096	0×256	11×16	3×1
Hexademinal Value	2	0	B(11)	3

$$\text{Result} = 8192 + 0 + 176 + 3 = 8371$$

Case2

Hex Value	2	0	B	3
Binary Val	0 0 1 0	0 0 0 0	1 0 1 1	0 0 1 1
Binary Eq	$2^{15} 2^{14} 2^{13} 2^{12}$	$2^{11} 2^{10} 2^9 2^8$	$2^7 2^6 2^5 2^4$	$2^3 2^2 2^1 2^0$
Denary Eq	(1×2^{13})		$(1 \times 2^7) + (1 \times 2^5) + (1 \times 2^4)$	$(1 \times 2) + (1 \times 2^0)$
	8192	0	176	3

$$\text{Result} = 8192 + 0 + 176 + 3 = 8371$$

ii)12AE5

Case 1

	65536	8192	2560	224	5
Result	1×16^4	2×16^3	10×16^2	14×16^1	5×16^0
Hexademinal Value	1	2	A	E	5

$$\text{Result} = 65536 + 8192 + 2560 + 224 = 76517$$

Case2-See case 2 of question 1

(b) Binary Coded Decimal (BCD) is another way of representing numbers.

(i) Write the number 359 in BCD form. [2]

(ii) Describe the use of BCD number representation, with an example. [2] ✕

(i)

3	5	9
0011	0101	1001

ii) BCD is used to represent some numbers that are not proper numbers (numbers that don't behave like numbers e.g Barcode

4 In a particular Computer System, real numbers are stored using floating-point representation with

8 bits for the mantissa, followed by 8 bits for the exponent

Two's complement form is used for both mantissa and exponent.

(a) A real number is stored as the following two bytes.

Mantissa	Exponent
0 0 1 0 1 0 0 0	0 0 0 0 0 0 1 1

Calculate the denary value of this number. Show your working. [3]

Given

mantissa: 00101000

Exponent: 00000011

Denary(n) = Mantissa * 2^{exponent}

$$N = m * 2^e$$

$$N = 0.0101000 * 2^3$$

$$N = 10.1$$

$$N = 2.5$$

(b) Explain why the floating-point number in part (a) is not normalised. [2]

-Normalised numbers begin with 01 or 10

5 Examine any five factors why e-business is needed. [10]

- **Resource Management and Globalisation** - cloud based ERP (Enterprise Resource Planning) solution enables managers to manage or monitor their organisational resources virtually anywhere in the world by using their personal computer, laptops, tablets or Smartphone.
- **Customer Support and Satisfaction** - Internet Technology enables effective communication, which is the best tool to understand the customer demands, problems and their solutions.
- **Marketing and Business Growth** - Digital Marketing enables promotion of products or services all over the world.
- **Decision Making** - enables management to make the right decision by conducting market research through online surveys, forums, blogs, group discussions using World Wide Web and of course through in-person interviews as well.
- **Less Restrictive Hours**- Information can be accessed at all hours and at everyone's leisure, which makes for a more pleasant experience overall for both the e-business and the customer

6 Cloud computing is now used mostly by individuals and organisations.

- (a) Define *cloud computing*.
- (b) Give any two cloud services that are commonly used. *
- (c) List any three cloud service models and their purposes. *

(a) Cloud computing refers to the delivery of on demand computer services on the internet

(b)

- public cloud
- Private cloud

(c)

- IAAS(infrastrucutre as a service) -For storage and virtual machines
- PAAS(platform as a service) –Provides cloud platforms for developing, managing and deploying software
- SAAS(Software As a service)- Handles all software required by the

- 7 The world over, devices access to the Word Wide Web (www) content using IP addressing.
- (a) Expand the acronym IP. [1]
- (b) Copy and complete the table below, indicating for each IP address whether it is valid or invalid and give a suitable reason.
- | address | denary /hexadecimal | valid or invalid | reason |
|---------------|---------------------|------------------|--------|
| 3.2A.6AA.BBBB | hexadecimal | | |
| 2.0.255.1 | denary | | |
| 6.0.257.6 | denary | | |
| A.78.F4.JB | hexadecimal | | |
- [6]*
- (c) Distinguish between *public* and *private IP addresses*. [3]

(a) Internet Protocol

(b)

address	Den/hex	Valid/invalid	Reason
2.2A.6AA.BBBB	Hex	invalid	4 th group doesn't have at least 1 digit
2.0.255.1	Den	valid	All conditions satisfied
6.0.257.6	Den	invalid	3 rd group exceeded 255
A.78.F4.JB	hex	invalid	4 th group has no digit

Additional Notes for validation of ip addresses(OR DID YOU KNOW?)

- It must have four groups of digits separated by dots.
- Each group must have either one or two digits.
- Each digit must be a valid hexadecimal or denary symbol.
- If the address is hexadecimal, each group must have a value between 0 and FF (which is equivalent to 0 and 255 in denary).
- If the address is denary, each group must have a value between 0 and 255

- (c) Distinguish between *public* and *private IP addresses*. [3]

Public IP	Private IP
Globally unique	Assigned by your NIFC network information centre
Can be accessed on the internet	Limited to your LAN

- 8 (a) Define the following terms.
- (i) Firewall [2]
 - (ii) Authentication [2]

A(i) a firewall is a network security system that monitors and controls incoming and outgoing network traffic based on predetermined security rules

(ii) Authentication is the process of verifying the identity of a user or process

- (b) Distinguish between *data integrity* and *data security*. [2]

- data security is about protecting data from unauthorized access or corruption, while data integrity is about ensuring that the data is accurate and consistent

- (c) Data integrity is required at the input stage and also during transfer of data.

- (i) Suggest any **two** ways of maintaining data integrity at the input stage. Use examples to help explain your answer. [2]
- (ii) Show any **two** ways of maintaining data integrity during data transmission. Use examples to explain your answer. [2]

(i)

- **Validation:** Validation is the process of checking that the data entered is sensible, reasonable, and within acceptable boundaries
- **Verification:** Verification is the process of checking that the data entered matches the original source of data
- **Data cleansing:** Data cleansing is the process of detecting and correcting errors or inconsistencies in the input data

(ii)

- **Encryption:** transform data into a secret code that can only be deciphered by authorized parties. Example: public-key or symmetric-key encryption.

- **Error detection and correction:** identify and correct errors that may occur during data transmission due to noise, interference, or distortion. Example: parity bits, checksums

9	(a)	Define the terms <i>sorting</i> and <i>searching</i> .	[2]
	(b)	Analyse the <i>bubble sort method</i> and the <i>quick sort method</i> .	[6]
	(c)	Produce the binary search method showing the algorithm syntax.	[7] ✖

- Sorting: Refers to a process of arranging (organising) records in a specific ordered sequence, like in ascending or descending order of the key field
- Searching: Refers to a process of looking for a particular record, cell or database

b)

Feature	Bubble Sort	Quick sort
Adaptive	No	Yes
Worst case scenario	When the array is in reverse order	When the array is already sorted
Best case scenario	When the array is already sorted	When the array is partially sorted
Complexity analysis	Number of comparisons and swaps	Number of comparisons
Implementation	Simple	Complex
Performance	Slow	Fast
Stability	Maintains the relative order of elements with equal values	Does not maintain the relative order of elements with equal values
In-place	Sorts the array in the same memory space that it was originally stored in	Sorts the array in a new memory space
Recursive	Calls itself to sort smaller subarrays	Does not call itself to sort smaller subarrays
Adaptive	The time complexity depends on the input data	The time complexity is not affected by the input data

c)

```
Place first item into root node
For subsequent items, start from root node
Repeat If (new item > this node item) Then
    Follow right pointer
Else
    Follow left pointer
Endif
Until pointer =0
Place item at this node
```

- 10 (a) A relational database management system (RDBMS) implements features of the relational model. Outline any **three** components of the (RDBMS) and explain each. [6]
- (b) Outline **four** different data types available in SQL. [4]

(a)

- Tables: Tables are the basic unit of data storage in a relational database. A table consists of rows and columns. The rows represent individual records, and the columns represent the attributes of those records.
- Columns: Columns are the vertical structures in a table. They represent the attributes of the data stored in the table.
- Rows: Rows are the horizontal structures in a table. They represent individual records of data stored in the table.
- Primary key: The primary key is a column that uniquely identifies each record in a table.
- Foreign key: A foreign key is a column that references the primary key of another table.
- Schema: The schema is a blueprint of the database. It defines the tables, columns, and relationships between the tables.

b) data types in sql

- Integer
- Float
- String

Hope you Enjoyed Physically -----

Philippians 4:6-7 "Do not be anxious about anything, but in every situation, by prayer and petition, with thanksgiving, present your requests to God. And the peace of God, which transcends all understanding, will guard your hearts and your minds in Christ Jesus.

-----**0716057680 LIONEL CYBERWAVE**





For Performance Measurement

PAPER2

N21 COMPUTER SCIENCE 6032 MS

Compiled By Cyberwave Gods Own

.....Proverbs 16:3

For Anhad Eduvain Solutions Pvt. Ltd.


Director

Suggested Ms Revised @ Reviewed | Cyberwave Gods Own

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

1 A boiler (B) will be ON if:

- the timer (C) is ON and temperature sensor (T) is OFF

OR

- Timer (C) is OFF and frost sensor (F) is ON.

(a) Deduce the

(i) Boolean statement; [3]

(ii) Boolean expression. [3]

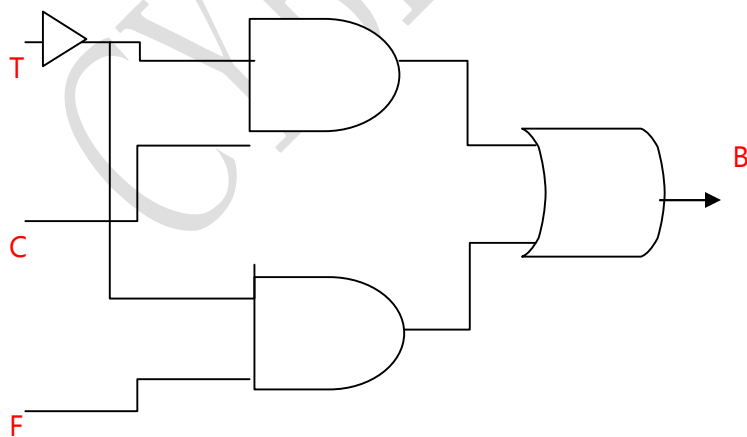
(i) $B=1$ IF $(C=1 \text{ AND } T=0) \text{ OR } (T=0 \text{ AND } F=1)$

(ii) $B=1$ IF $(C=1.T=0)+(T=0.F=1)$

(b) Draw a logic circuit for the system. [5]

(c) Produce a truth table for the system. [4]

(b)



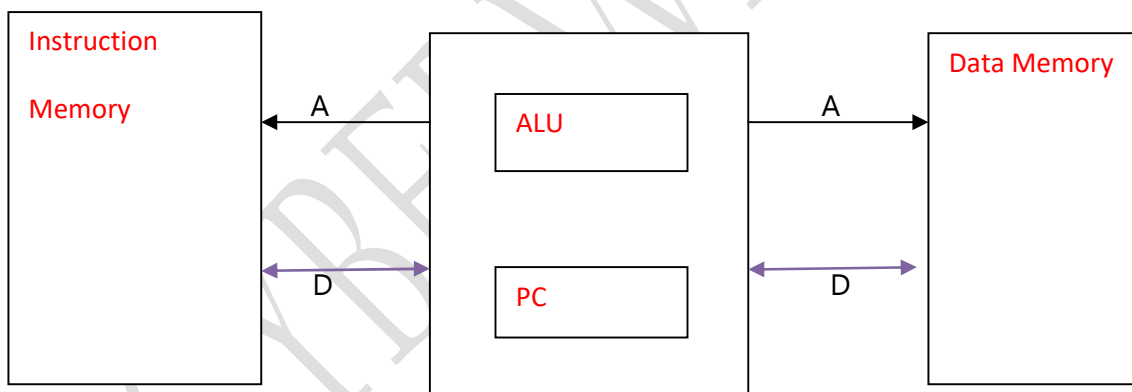
Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

TRUTH TABLE

T	C	F	T'	T'.C	T'.F	(T'.C)+(T'.F)
0	0	0	1	0	0	0
0	0	1	1	0	1	1
0	1	0	1	1	0	1
0	1	1	1	1	1	1
1	0	0	0	0	0	0
1	0	1	0	0	0	0
1	1	0	0	0	0	0
1	1	1	0	0	0	0

(d) Draw a simplified and well-labelled diagram of a Havard Computer architecture.

[5]



A-Address bus

D-Data Bus

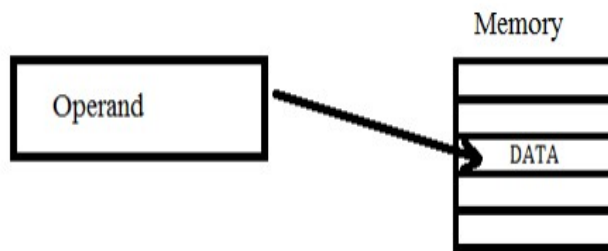
MAKE SURE YOU DRAW DIAGRAMS WITH SOME LOGIC FOR FULL MARKS

2 (a) Using a suitable application software package, draw diagrams to illustrate the following addressing modes:

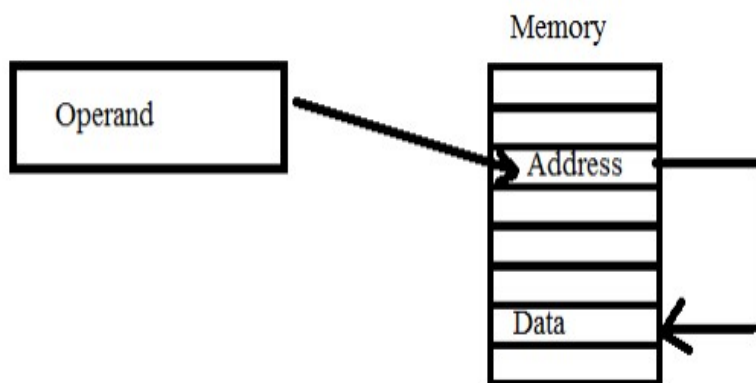
- (i) Direct
- (ii) Indirect
- (iii) Immediate
- (iv) Indexed
- (v) Relative

[15]

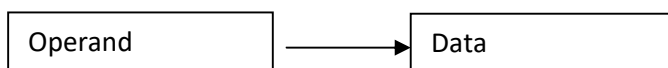
(I)direct



(ii)Indirect



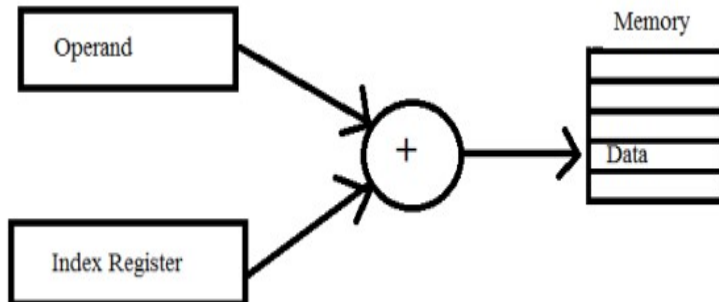
(iii) Immediate



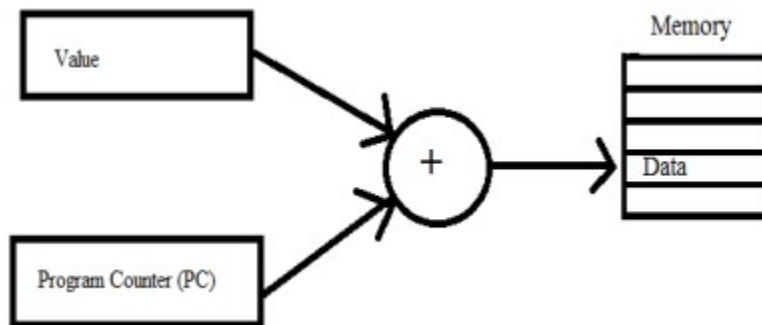
Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

A common example would be LDA#45

(iv) Indexed



(v) Relative



Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

(b) Identify the logic gates described below and draw the symbol and type the logic expressions that

(i) produce a high output when the number of high inputs is odd;

(ii) produce a high output when all of its inputs are identical. [5]

(i) $X=1$ IF $(A=1 \text{ AND } B=0) \text{ OR } (A=0 \text{ AND } B=1)$



(ii) $X=1$ IF $(A=1 \text{ AND } B=1) \text{ OR } (A=0 \text{ AND } B=0)$



SECTION B

3 (a) Study the pseudocode below.

```

10  FUNCTION Myfunction (BYVAL x : INTEGER); LONG
20  IF x > 0 THEN
30  Myfunction = x * Myfunction (x - 1)
40  else IF x = 0 THEN
50  Myfunction = 1
60  ELSE
70  Myfunction = 0
80  END IF
90  END IF
100 END FUNCTION
    
```

(i) Produce a trace table (or otherwise) for the function call
Myvalue = Myfunction. (5)
to show how the final value is assigned to the return value. [6]

(ii) Identify the line number which shows this algorithm and explain
why. [2]

x	Myfunction(x)	Calculation
5	120	5 * 24
4	24	4 * 6
3	6	3 * 2
2	2	2 * 1
1	1	base case
0	1	base case

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

ii)

The line number that shows the algorithm for calculating the product of all positive integers up to x, or zero if x is negative, is **30**. This is because this line is where the function calls itself recursively with x - 1 as the new parameter and multiplies the result by x. This is the main logic of the algorithm, which uses recursion to break down the problem into smaller subproblems until it reaches the base case of x = 0 or x = 1, where it returns 1.

(iii) Re-write the algorithm using iteration to perform the same task. [10]

Do

IF x>0 Then

Myfuction =x*myfunction(x-1)

Elseif x=0 Then

Myfunction =1

EndIF

EndIf

Loop Until(x<0)

End Loop

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

(b) Write an algorithm using pseudocode or otherwise that accepts 30 integers into an array and then outputs the following statistical data:

(i) mean (average of the number)

[6]

Begin

sum $\leftarrow$ 0

For index= 0 to 29

Input number(index)

Sum=sum + Number(index)

Next

Average= sum/30

Display Average

End

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

(ii) whether or not the mean value is part of the data that was input by the user

Begin

sum ← 0

For index= 0 to 29

Input number(index)

Sum=sum + Number(index)

Next

mean= sum/30

Display mean

For index= 0 to 29

If number(index)=mean Then

Modification to code 1

Display "Mean is also an input"

Next

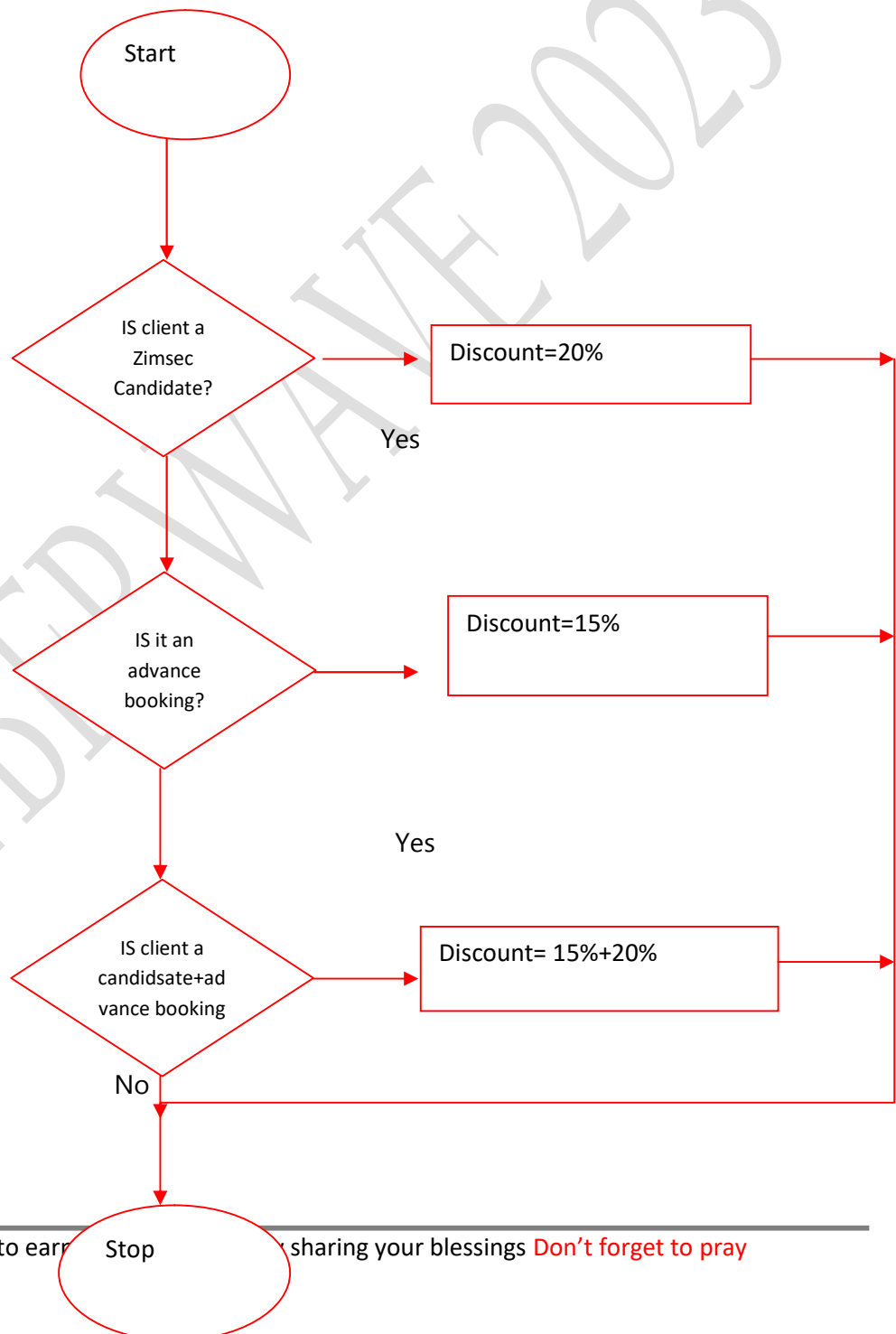
End

(c) PaGumbo Travel Agency runs an airline for its clients. For a particular flight, the agency charges \$1000.00. They offer discounts using the following criteria in the same order of precedence.

1. ZIMSEC candidates get 20% discount.
2. Advance bookings are granted a further 15% discount on any amount charged.

Construct a flowchart for the calculation of airfares due to clients.

[8]



- (d) Using a programming language of your choice, write (code) the declaration and initialisation of a 2-dimensional array of characters with the character 'X'.

[8]

Module Module1

Sub Main()

Dim array2d(2, 2) As String

array2d(0, 0) = "X"

array2d(0, 1) = "X"

array2d(0, 2) = "X"

array2d(1, 0) = "X"

array2d(1, 1) = "X"

array2d(1, 2) = "X"

array2d(2, 0) = "X"

array2d(2, 1) = "X"

array2d(2, 2) = "X"

Console.ReadLine()

End Sub

End Module

case 2

Module Module1

Sub Main()

Dim array2d(2, 2) As String

For i = 0 To 1

For j = 0 To 1

array2d(i, j) = "X"

Next j

Next i

Console.ReadLine()

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

End Sub

End Module

- (e) Write a line of code that will ensure that if a user input a string, only the first character is taken. [2]

output

Module Module1

Sub Main()

Dim text As String

Dim c As String

Console.WriteLine("Enter text")

text = Console.ReadLine

For Each i In text

c = text(0)

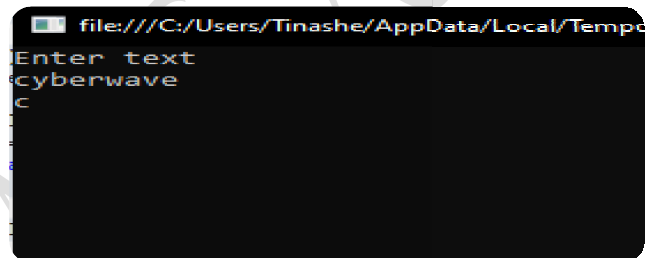
Next

Console.WriteLine(c)

Console.ReadLine()

End Sub

End Module



Cyberwave ~Official
$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$$

- 4 Xolani is a programmer at ABC Building Contractors. He is required to develop a program to calculate employee wages at the end of each week. The program is expected to collect the following information from the user.

Employee Name
Number of hours worked

The program then computes and outputs the following information.

Normal pay
Overtime pay
Tax
Gross pay
Net pay

After calculating pay for one employee, the program should re-initialise the interface for the next employee's details to be accepted and processed.

Notes

Normal working hours	40
Normal rate per hour	\$8.00
Overtime rate per hour	\$12.00
Tax rate (Overtime not taxed)	10.00%

- (a) Design a user interface for the program.

[10]

Public Class Form1

Dim fullrate As Integer

Dim normalhours As Integer = 40

Dim normalratehr As Integer = 8

Dim overtimehr As Integer = 12

Dim taxrate As Integer = 10

Private Sub GunaButton1_Click(sender As Object, e As EventArgs) Handles GunaButton1.Click

Dim normalpay As Integer

Dim overtimepay As Integer

Dim tax As Integer

Dim grosspay As Integer

Dim netpay As Integer

Dim hours As Integer = Val(hrsworked.Text)

If hours <= normalhours Then

normalpay = Val(normalratehr) * Val(hours)

tax = 0.1 * Val(normalpay)

overtimepay = 0

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

grosspay = Val(normalpay) + Val(overtimepay)

netpay = Val(grosspay) - Val(tax)

ElseIf hours > 40 Then

normalpay = normalratehr * hours

tax = 0.1 * Val(normalpay)

overtimepay = (hours - 40) * 12

grosspay = normalpay + overtimepay

netpay = grosspay - tax

End If

Guna2DataGridView1.Rows.Add(emplname.Text, hours, normalpay, overtimepay, tax, grosspay, netpay)

emplname.Text = ""

hrsworked.Text = ""

End Sub

End Class

Employee name	Hours Worked	Normal pay	Overtime pay	Tax	gross pay	netpay
cyberwave	5	40	0	4	40	36
programmin...	15	120	0	12	120	108
tutorials	41	328	12	33	340	307
youtube	200	1600	1920	160	3520	3360

Employee name

Number of hours worked

 Calculate

Cyberwave ~Official
$$f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$$

Module Module1

Sub Main()

Dim vowels() As String = {"a", "e", "i", "o", "u"}

Dim statement As String

Dim count As Integer

Dim countv As Integer

Dim countf As Integer

countf = 0

count = 0

countv = 0

Console.WriteLine("enter 200 characters")

statement = Console.ReadLine()

For Each c As Char In statement

If Char.IsUpper(c) Then

count += 1

End If

Next

For i = 0 To UBound(vowels)

For Each e As Char In statement

If e.Equals(CChar(vowels(i))) Then

countv += 1

End If

Next

Next

For Each f As Char In statement

If Char.IsPunctuation(f) Then

countf += 1

End If

Next

Console.WriteLine("Uppercase :{0} Vowels: {1} Consonants: {2}", count, countv, countf)

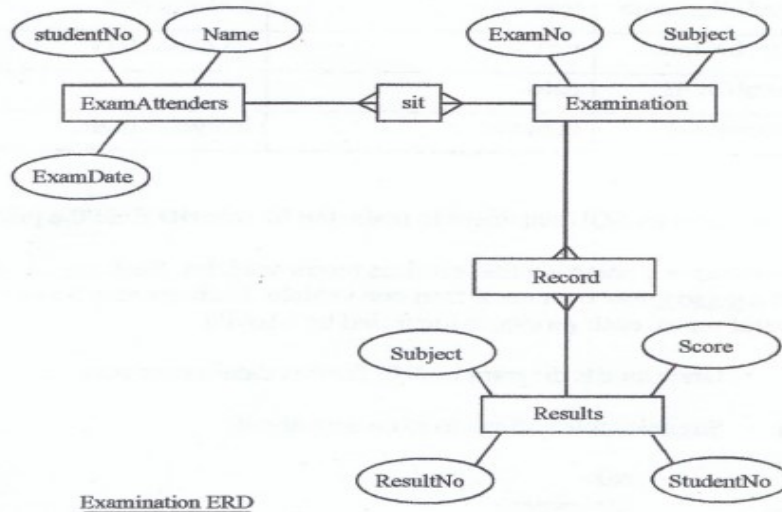
Console.ReadLine()

End Sub

End Module

SECTION C

5 The diagram below is an entity-relationship diagram for an Examinations Database.



(a) Write SQL code to create the tables in a database represented in the Examinations ERD.

[17]

Create table ExamAttendees (

StudentNo INT NOTNULL,

Name varchar(15) NOTNULL,

ExamDate date NOTNULL

);

Create table Examination (

ExamNo INT NOTNULL,

Subject varchar(15) NOTNULL

);

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

Create table Results (

Subject varchar(25) NOTNULL,

Score INT NOTNULL,

ResultNo INT NOTNULL,

StudentNo INT NOTNULL

);

- (b) (i) Write SQL statements to display all fields in the examAttendees table for a student identified by StudentNo = R0013. [3]

Select * From ExamAttendees WHERE StudentNo='R0013'

- (ii) Write SQL statement(s) to delete Computer Science Paper 4 from the examination table. [3]

DELETE FROM Examination

Where Subject='Computer Science Paper 4'

- (iii) Write SQL statements to add a duration field in the examination table. [3]

ALTER TABLE examinations

ADD duration VARCHAR(10);

- (iv) Write SQL statement(s) to change score for ResultNo 138 from 70 to 95. [3]

ALTER TABLE Results where ResultNo ='138'

Set score ='95'

- (c) Suggest a key that could be used to establish the link between Examinations and Results tables.

[1]

Subject

- 6 (a) Using SQL create the following table.

Table : Member

Field	Datatype	Size
MemberID	text	10 characters
MembSurname	text	5 characters
MembName	text	35 characters
MembDOB	date	
MembRank	numeric	integer 3 digits

[10]

CREATE TABLE Member(

Field VARCHAR(30) NOTNULL,

Datatype VARCHAR(10),

Size VARCHAR()

)

INSERT INTO Member(Field,Datatype,Size)

VALUES

('MemberID','text','10 characters')

('MembSurname','text','5 characters')

('MembName','text','35 characters')

Cyberwave ~Official $f(x) = a_0 + \sum_{n=1}^{\infty} \left(a_n \cos \frac{n\pi x}{L} + b_n \sin \frac{n\pi x}{L} \right)$

('MembDOB','date','')

('MembRank','numeric','integer 3 digits');

(b) Write down an SQL statement to make the MemberID field the primary key. [2]

ALTER TABLE Member

ADD CONSTRAINT PK_Member PRIMARY KEY (MemberID);

Cyberwave Solutions

Inspired by the great works of God

Philippians 4:13

Proverbs 16:3

Tricks to ace paper 2 exams CS

- Regular coding practice
- Think outside the box before writing your everyday code
- Apply programming to your day to day life i.e create pure mathematics math solving tools
- Remember nobody is born a genius, never be afraid to ask
- GPT is an assistant, never tell it to do your programming assignments because those assignments are there to stretch you not to trouble you
- Have computer science related dreams in your mind at all times when you study, it will naturally push you to work harder

0716057680- GOD BLESS YOU

~Thanks for your unending support