



CYBERSPACE INC COMPUTER SCIENCE

ZIMSEC 2023 PAPER1 MS

2023 SOLUTIONS

FULLY GUIDED SOLUTIONS FOR ZIMSEC EXAMS

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@CYBERSPACE-2024

- 1 (a) State the number of bits used for each character in each of the following data representation types:
- (i) ASCII
 - (ii) Unicode

a)

i) ASCII - 7 bits

lets clear some confusion

ASCII uses 7 bits for most characters but 8 bits for extended characters . Meaning that there are 2^7 characters in ASCII and 2^8 in extended ASCII

ii) Unicode-16 BITS

lets clear some confusion

(UCS-2) uses 16 bits and (UCS-4) uses 32 bits

ii) BCD-4 bits

(b) Define the following terms with respect to binary representation:

(i) *overflow*

(ii) *underflow*

b)

i) overflow occurs when the results of an arithmetic calculation are greater than the **maximum** number of bits that can be represented

imagine trying to pour 2L of Mazoe into a 500ml Mirinda bottle-overflow

ii) i) underflow occurs when the results of an arithmetic calculation are lesser than the **minimum** number of bits that can be represented

(c) Convert the following numbers to 8 bit binary form:

(i) 109.

(ii) 75

C

i) 109

Case1

2	109	
2	54	r 1
2	27	r 0
2	13	r 1
2	6	r 1
2	3	r 0
2	1	r 1
	0	r 1

count the remainders going up

$109_{10} = 1101101_2$

Case 2

128	64	32	16	8	4	2	1
0	1	1	0	1	1	0	1

$= 109_{10}$

- 2 (a) Take the 2's complement of the binary value of 75 and hence compute $109-75$ using binary addition. Give your answer in 8 bit binary form.
- (b) Normalise the following floating point numbers.
- (i) $0.0001000\ 0001_2$
- (ii) $11011.101\ 1001_2$

Food for thought!-----

The 2's complement of any number is its negative binary equivalence

For e.g -5 is equivalent to the 2's complement of 5

2a)

Step1- convert 75 to binary form

Step2- convert 75 to 2's complement to make it -ve

75= 01001011(see example above to learn conversion 8 bits)

To convert to 2's complement, use any of the 2 ways

Case1(long and boring...)

1.Convert to 1's complement(invert every 1 to 0 and 0 to 1)

01001011 $\rightarrow$ 10110100

2.Add 1 to the result

10110100+1 $\rightarrow$ **10110101₂**

NB: MSB IS 1 MEANING THE NUMBER IS -VE

Case2(cool)

1.Start from less significant bit(far ryt) and ignore any 0s up to the first 1, invert everything)

01001011----- (ignore the first one and invert everything) → **10110101₂**

Now....

100-75 is the same as 100+ (-75)

100 → 01100100

-75 → 10110101 +

	0	1	1	0	0	1	0	0
	1	0	1	1	0	1	0	1
	+							
1	0	0	0	1	1	0	0	1

Since there has been an overflow of bits, we consider 8 bits only and the overflow bit is lost i.e

1 0 0 0 1 1 0 0 ₁₂ ==25 proved.

(b) Normalise the following floating point numbers.

(i) $0.0001000\ 0001_2$

(ii) $11011.101\ 1001_2$

Food for thought....

Binary normalization should leave the binary numbers starting with 01 or 10 not ~~00~~ or ~~11~~

1

0.0001000 0001 do you see the problem??

But first, lets look at our question

0.0001000 0001₂

mantissa ← ← exponent (i.e 1₁₀)

0.0001000 0001



we jump 3 zeros to reach the next 01(normal state),add those 0s to the end of your mantissa and subtract 3 from the exponent value i.e $1-3 = -2$

01000000 1110 Normalised

ii)see i)



- 3 (a) Define the term *Domain Name System (DNS)*.
- (b) For the IP address 192.100.18.33:
- (i) identify the class IP address
 - (ii) state the subnet mask of the IP address,
 - (iii) convert the IP address in (b) to binary format
- (c) For the following URL
[http: // www.zimsec.co.zw / Exams / computer science. pdf](http://www.zimsec.co.zw/Exams/computer%20science.pdf)

3

a) Domain name system is a distributable system that translates domain names to their IP addresses. We can just say it's the phonebook of the internet kkk

b) IP 192.100.18.33

i) Class C

Food for thought

Address class	Range	Default Subnet Mask
A	1.0.0.0 to 126.255.255.255	255.0.0.0
B	128.0.0.0 to 191.255.255.255	255.255.0.0
C	192.0.0.0 to 223.255.255.255	255.255.255.0
D	224.0.0.0 to 239.255.255.255	Reserved for Multicasting

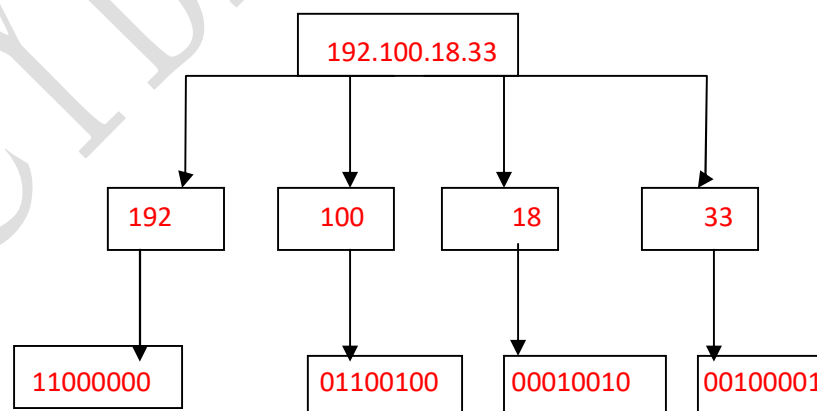
ii) 255.255.255.0

iii)

IP

DECIMAL

BINARY



c) Protocol

[http://www.zimsec.co.zw/Exams/computer science](http://www.zimsec.co.zw/Exams/computer%20science)

Protocol//hostname.domainname/Directory-path/Document-name

1. NOCZIM has benefited from the use of cloud computing. Cloud computing has enabled NOCZIM to backup data in the cloud.

(a) Describe any *two* cloud service models.

a)Software as a service (SaaS)

- is a software distribution model in which a third-party provider hosts applications and makes them available to customers over the Internet.
- A service provider hosts the application at its data center and a customer accesses it via a standard web browser.

Platform as a Service (PaaS) or application platform as a Service (aPaaS) or platform base service

- Provides a platform allowing customers to develop, run, and manage applications without the complexity of building and maintaining the infrastructure necessary for development and launching of an application.

Infrastructure as a service (IaaS) or hardware as a service (HaaS).

- a service model that delivers computer infrastructure on an outsourced basis to support enterprise operations.
- provides virtualized computing resources (i.e provides hardware, storage, servers and data center space or network components; and may also include software.)over the internet

b)

Downtime: Cloud computing systems are internet-based, and service outages are always a possibility. This can lead to financial losses and impact business operations

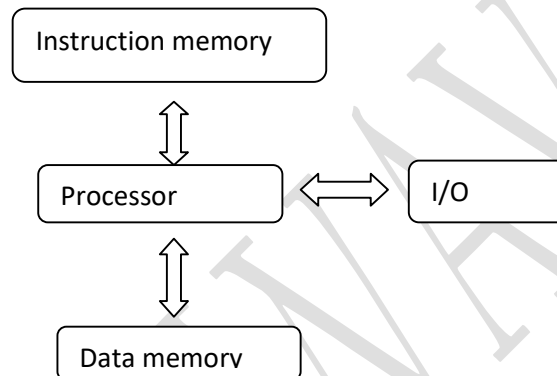
Security and privacy concerns: Cloud services might go offline unexpectedly, raising privacy concerns and giving users less control. Lack of expertise can lead to security issues and unnecessary expenses, but this can be addressed through constant training and certification of personnel

Vendor lock-in: It can be difficult to transfer services from one vendor to another, which can lead to vendor lock-in

Performance issues: Performance issues can arise if the cloud server is down, as all cloud-based systems are tied to the server's performance. Technical issues and shared resources can also affect the performance of cloud-based applications

- 5 (a) Draw a clearly labelled diagram to represent the Harvard Arch
- (b) Explain *three* (3) buses used in the Von Neumann model.

a)



P.S we only care about separate memory locations , the rest that's drama!!!

b)

Data bus

- Used for carrying data from memory to the processor and between I/O ports.

Address bus:

- This is a uni-directional bus (one way). The address is sent from CPU to memory and I/O ports only.
- Used for transferring memory addresses from the processor when it is accessing main

Memory

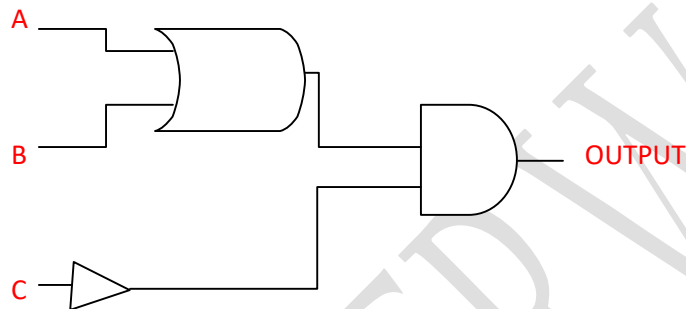
Control bus

- This is a bi-directional bus used for carrying control signals (Signals can be transferred in both directions). It transmits command, timing and specific status information between system components.

6 Design a logic circuit for the following logical expression.

$$(A + B) \cdot \bar{C}$$

(b) Describe the stages of the fetch / decode / execute cycle, paying to how the Special registers in the processor are used.



B)

Fetch

The PC stores the address of the next instruction to be carried out (because instructions are held sequentially in the memory, the value in the PC is incremented so that it always points to the next instruction.) When the next instruction is needed, its address is copied from the PC and placed in the MAR

- The data which is stored at the address in the MAR is then copied to the MDR . Once it is ready to be executed, the executable part of the instruction is copied into the CIR

Decode

- The instruction in the CIR can now be split into two parts, the address and the operation . The address part can be placed in the MAR and the data fetched and put in the MDR.

Execute

- The contents of both the memory address register and the memory data register are sent together to the central processor. The ALU will keep referring back to where the data and instructions are stored, while it is executing them, the MDR acts like a buffer, storing the data until it is needed
- The CU will then follow the instructions, which will tell it where to fetch the data from, it will read the data and send the necessary signals to other parts of the computer.

7	(a)	A doctor plans to share patients' records on a computer system.
	(i)	State any three data protection principles that the doctor obey.
	(ii)	Explain two possible effects if the doctor does not obey protection principles.
	(b)	Define the term data <i>integrity</i> .

7ai)

- 1) **Lawfulness, fairness and transparency** . The doctor must have a lawful basis for sharing patient records . That includes their consent for legal reasons for public interest
- 2) **Purpose Limitation** : doctor should only share patient details for specific reasons which they were collected for
- 3) **Data Minimisation** : The doctor should only share minimum amount of information about client

ii) Legal and professional consequences:

Data protection fines : the doctor can be fined for such

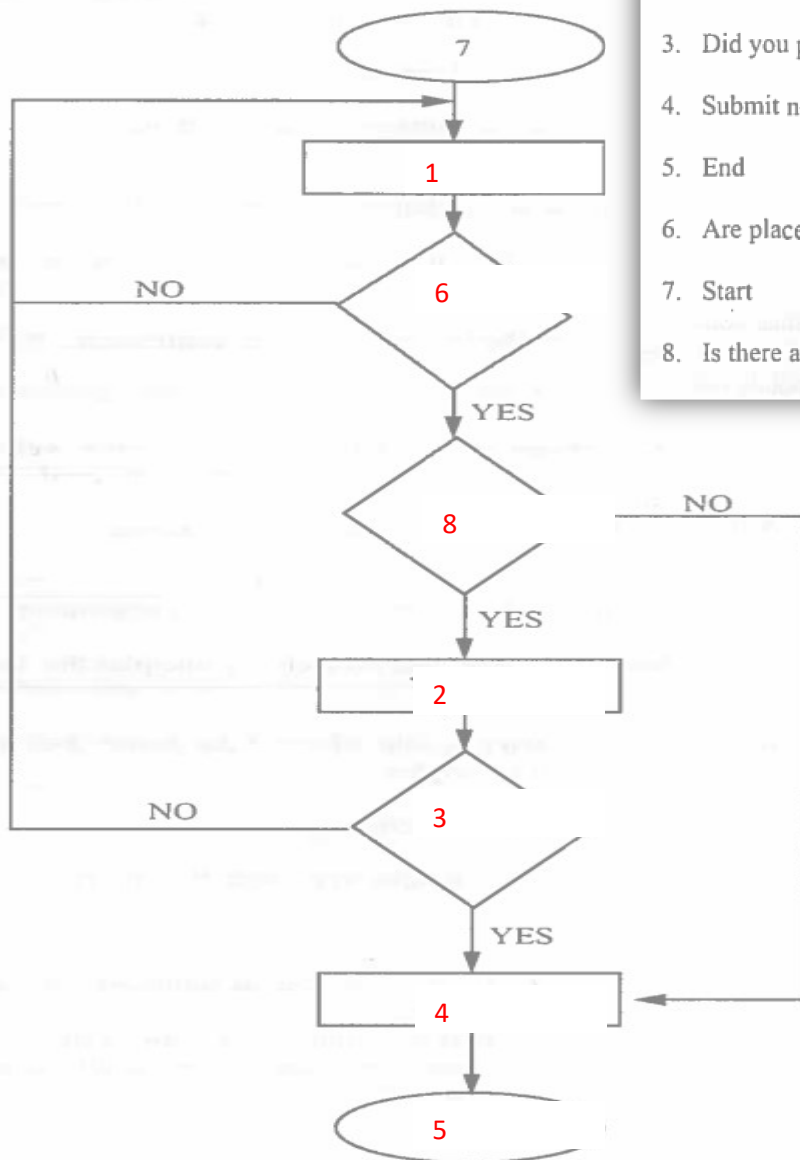
Loss of patients trust : Once patients learn that their medical information is being mishandled, they may lose trust in their doctor

Licence revocation: The doctor may even lose their license to operate their business

- b) **Data integrity** refers to the correctness of data before processing, during and after
- c) Fingerprint Authentication
 - Doctor places his finger on a fingerprint scanner
 - Scanner captures an image of doctors fingerprint
 - image is compared to a stored template of doctors fingerprint
 - if match is successful, access granted else declined

CYBERWAVE

- 8 (a) The empty flowchart below gives steps followed when seeking admission to a new school. The phrases to be filled in the boxes are also given. Complete the flow chart by filling in the number of the corresponding phrase in each empty box. For example, the number corresponding to the first box in the flowchart is 7. [4]



1. Search for a school.
2. Prepare for the admission.
3. Did you pass the exam?
4. Submit necessary documents and get admission.
5. End
6. Are places available
7. Start
8. Is there an admission test?

That is a stupid way of writing code
on paper just say Array(0,5)

(b) The following is a recursive procedure that is called from the main m

```

Module Main ( )
    Call Array × (0,5)
End module

Procedure Array × (Low, high)
    If low <= high Then
        Print (Array × (Low) * Array × (high))
        Array×(Low +1, high)
    End if
End procedure

```

Using a trace table, dry run the above algorithm using the following
Array X data.

Array(low,high)	Array(Low)	Array(high)	Is low <=high?	print	
Array(0,5)	3	1	True (0<=5)	3*1	3
Array(1,5)	5	1	True	5*1	5
Array(2,5)	2	1	True	2*1	2
Array(3,5)	7	1	True	7*1	7
Array(4,5)	4	1	True	4*1	4
Array(5,5)	1	1	true	1*1	1
Array(6,5)	BASE CASE NO OUTPUT HERE				

(c) The following is a list of elements that need to be sorted.

3 5 2 7 4 1

Demonstrate how the elements can be sorted using a bubble sort. Just show output for each pass.

Food for thought...

Imagine throwing seeds in water, heavier ones will sink replacing lighter ones in that order

3
5
2
7
4
1

2
1
3
4
5
7

3
5
2
4
1
7

1
2
3
4
5
7

Sorted!!!!

3
2
4
1
5
7

3
2
1
4
5
7

- 9 (a) Explain the term *data redundancy* giving a suitable characteristic which leads to it.

A situation whereby there is duplication of data entries. Mostly due to the absence of a primary key in a RDMS

- (b) Given the following structure of SQL command, explain its 4 parts. Give examples on each part.

Create table <table name>

(Column name, Datatype, Optional column constraints

Optional table constraints)

1. **CREATE TABLE** :This is the keyword that tells the database system that you want to create a new table

2. **TABLE NAME**:this is the name of the table to be created

3. **COLUMN DEFINATION**: This is a list of the columns that will make up the table. Each column definition has a COLUMN NAME, DATA TYPE, OPTIONAL COLUMN CONSTRAINS

4. **OPTIONAL TABLE CONSTRAINTS**: these are restrictions that can be put on the entire table

- 10 (a) Define the term *financial literacy*.

- (b) You are the owner of an online shop, you can decide whether your customers have to pay after delivery by a money transfer from their bank account to your bank with a credit card, ZIPIT or using mobile wallet payment (Ecocash, Telecash, Netcash). All these variants have advantages and disadvantages for your online shop.

Assume that you can select only one of these methods. Which one would you select?

Give four reasons to justify your choice.

- (c) Computer Science plays a very important role in the field of engineering

10a) **financial literacy** refers to the possession of skills ,knowledge and behaviours that allow an individual to make informed decisions regarding their money

b)i would honestly chose mobile banking. However all of the given options have their relative pros and cons, here in Zimbabwe we consider convenience and popularity over security. As a matter of fact 9/10 individuals in a group own an ecocash account whereas only 1/10 own a credit card so yeah that's the thing

c)

Software prototyping: A prototype is a preliminary design or model for testing the viability of a concept. It enables us to try a new design or improve an existing product. Prototyping helps us specify working systems based on the prototype's performance rather than designing them completely before any coding and testing. By using feedback from users on the prototype, we can optimize the project before development. Starting a software project with a prototype enables us to save production costs.

Circuit prototyping: In order to create a circuit, a wire wrap technique, veroboard, or breadboard are often employed to make the circuit electronically accurate but not aesthetically akin to the design. Particular software, such as a program called Fritzing, can help in the prototyping process.

Computer-aided design (CAD): CAD software can be used to create 3D models of products, which can then be used to create physical prototypes. This can help designers visualize the product and make changes before creating a physical prototype.

Simulation: Computer science can be used to simulate the performance of a product before it is built, which can help identify potential problems and improve the design

Artificial Intelligence: it can also be used in design optimization ,material selection and even generating design ideas

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

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---GOD BLESS YOU ENGINEER-----

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