

12 Pages

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3. The answers must be legibly written. The Examiners can either ignore illegible script or have it typed and the expense of typing charged to the candidate.
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5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
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List the numbers of the questions you have attempted	Office Use
1	33
2	22
3	23
4	12
Total	90

binary
not anding
program

Examiner Only

33
20
22
12

90

87
Agreed 90

1.

33

33/38

a) Computers ~~read and~~ work in binary language. The importance of understanding ~~and~~ number systems allows us to program a computer, create applications and perform calculations. Hexadecimal allows for more unique sequences. With the fast pace of ~~ex~~ computer evolution number systems allow for the growth to take place and allow for devices to communicate in a wide area/or across the world.

b)

i)

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	1	1	1	0	1	0	1

$$245 = 11110101$$

ii.

2^9	2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
512	256	128	64	32	16	8	4	2	1
1	0	0	0	0	0	0	0	0	0

$$512 = 1000000000$$

c)i.

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	1	0	1	0	1	0	1

$$11010101 = 213.$$

ii.

2^8	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
256	128	64	32	16	8	4	2	1
1	0	1	0	1	1	0	0	1

$$101011001 = 345.$$

D)i.

2^3	2^2	2^1	2^0
8	4	2	1
1	1	1	0
1	0	1	0
1	0	1	1

$$= E$$

$$= A$$

$$= B.$$

$$111010101011 = EAB$$

ii.

2^3	2^2	2^1	2^0
8	4	2	1
1	0	0	1
1	1	1	1
0	0	1	0

$$= 9$$

$$= F$$

$$= 2.$$

$$10011110010 = 9F2.$$

E) i.

2^3	2^2	2^1	2^0
8	4	2	1

$$C = \begin{array}{|c|c|c|c|} \hline 1 & 1 & 0 & 0 \\ \hline \end{array} = 1100$$

$$3 = \begin{array}{|c|c|c|c|} \hline 0 & 0 & 1 & 1 \\ \hline \end{array} = 0011$$

$$C3 = 11000011$$

ii.

2^3	2^2	2^1	2^0
8	4	2	1

$$6 = \begin{array}{|c|c|c|c|} \hline 0 & 1 & 1 & 0 \\ \hline \end{array} = 0110$$

$$6 = \begin{array}{|c|c|c|c|} \hline 0 & 1 & 1 & 0 \\ \hline \end{array} = 0110$$

$$66 = 01100110$$

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
1	1	0	0	0	0	1	1

$$C3 = 195.$$

$$\text{check} = 12 \times 16 = 192 + 3 = 195$$

ii.

2^3	2^2	2^1	2^0
8	4	2	1

$$6 = \begin{array}{|c|c|c|c|} \hline 0 & 1 & 1 & 0 \\ \hline \end{array} = 0110$$

$$6 = \begin{array}{|c|c|c|c|} \hline 0 & 1 & 1 & 0 \\ \hline \end{array} = 0110$$

$$66 = 01100110$$

2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
128	64	32	16	8	4	2	1
0	1	1	0	0	1	1	0

$$66 = 102.$$

$$6 \times 16 =$$

$$\text{check} = 6 \times 16 = 96$$

$$= 96 + 6 = 102.$$

f) $2^3 = 8$

8 unique values can be represented by a 3-bit number.

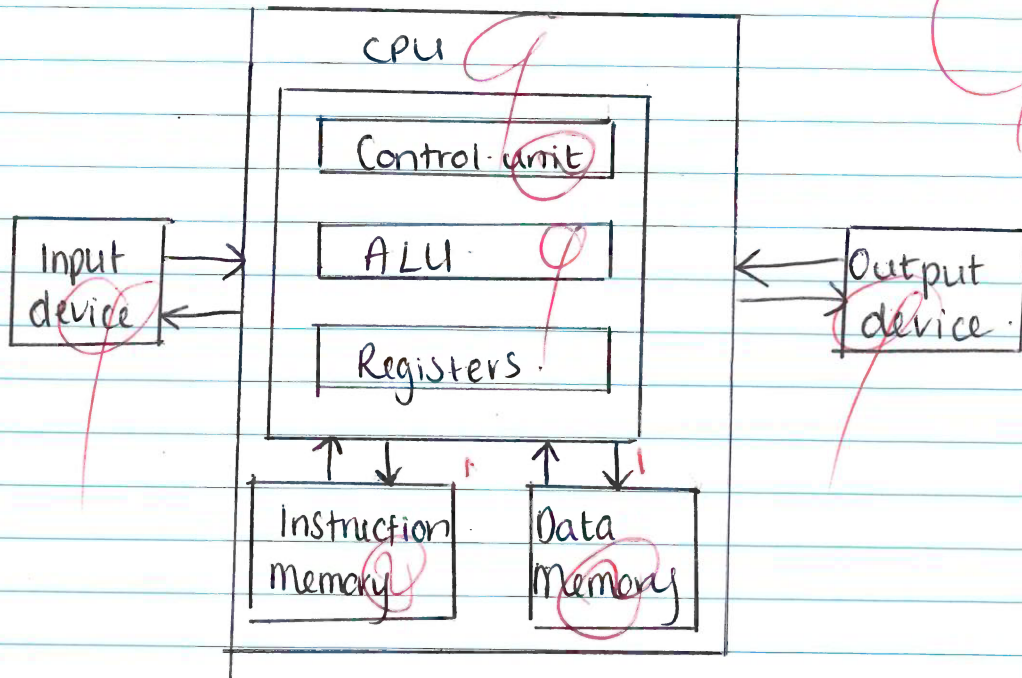
G) Conversion = $\frac{80 \text{ Mb/s}}{8} = 10 \text{ MB/s}$.

Time = $\frac{\text{file size}}{\text{Speed}}$.

Time = $\frac{36 \text{ MB}}{10 \text{ MB/s}}$

Time = $\frac{3.6}{\cancel{3.6}} \text{ Seconds}$.

2) a.



- b. Cache memory is a small memory found in the CPU that temporarily holds frequently accessed data. This helps reduce the latency/time taken to fetch the data in comparison to the CPU fetching the data from the primary memory.

Registers are the smallest and fastest memory within a computer system and are the memory used in the instruction cycle that is ^{used} by the CPU to carry out machine code instructions.

3) a. ~~Hard disk drive~~

Secondary memory is non-volatile which means it will ^{store/keep} ~~hold~~ data even once the device has been turned off. It ~~allows~~ a user. There are two different secondary memory devices available, Hard-disk drive and Solid State drive.

A Hard Disk drive (HDD) is cheaper per GB ~~and~~ but is more fragile and slower in comparison to a Solid State drive (SSD). This is because an SSD has no moving parts making it ~~it~~ ~~more~~ durable and faster but more expensive per GB.

B?

b. RAID 0 =

- faster read ~~and~~ write
- if data ~~corrupts~~ on one drive it is lost

RAID 1 =

- fast read but slow write
- if ~~data~~ one drive ~~corrupts~~ data is not lost.

RAID 10 =

- More expensive as requires a minimum of 4 drives.
- ~~fast as it combines both~~
- Uses both Striping (RAID 0) and mirroring (RAID 1) of data.

C. RAID 0

HD1	A1	A3	A5	A7	A9
HD2	A2	A4	A6	A8	A10

RAID 0 ~~uses~~ Strips data and ~~devices~~ it amongst a pair of ~~B~~ Hard drives. Because of this data can be accessed/written in parallel making it fast read and write. ~~This~~ RAID 0 also uses 100% storage capacity, i.e. $2 \times 2\text{TB drives} = 4\text{TB}$ of available data. The disadvantage of ~~this~~ is stripping data is that the full ^{data} set is ~~is~~ distributed between drives. So if one is corrupted the data set is lost.

RAID 1.

HD1	A1	A2	A3	A4	A5
HD2	A1	A2	A3	A4	A5

RAID 1 ~~is~~ mirrors data of one drive onto another. This means there is fault redundancy. So if data on one drive in the pair corrupts data is still available on the other. RAID 1 is fast in reading as it can access data from both drives in parallel, but it is slow in writing as it is writing the data over two drives. RAID 1 only uses 50% ~~of~~ storage capacity, i.e., $2 \times 2\text{TB} = 2\text{TB}$. ~~This is means~~ ~~it~~. The disadvantage of mirroring is that if a virus is written onto one drive it will be ~~copy~~ copied to the other.

RAID 10

C.

Pair 1

HD1	A1	A3	A5	A7	A9
HD2	A1	A3	A5	A7	A9

Pair 2

HD3	A2	A4	A6	A8	A10
HD4	A2	A4	A6	A8	A10

RAID 10 combines RAID 0 and RAID 1.

It strips data and distributes it ^(RAID 0) to 2 different pairs of ~~two~~ drives. The second drives in each pair then mirrors (RAID 1) the data. This gives the benefit of both advantages of RAID 0 & 1, it is fast read & reliable. ~~Even if~~ It also eliminates the data corruption issue found in RAID 0 as if 1 drive fails the other still contains the data. The disadvantage of RAID 10 is that it is expensive as a minimum of 4 disks are required. ~~If a virus is imbedded in the data it can also be stripped and mirrored across~~

C7/8

d. RAID 0

Disadvantage = If one drive's data corrupts then data is lost. ②

advantage = 100% of storage capacity is used

RAID 1 -

Disadvantage = Slow write speeds.

advantage = If one drive corrupts data is not lost. ①

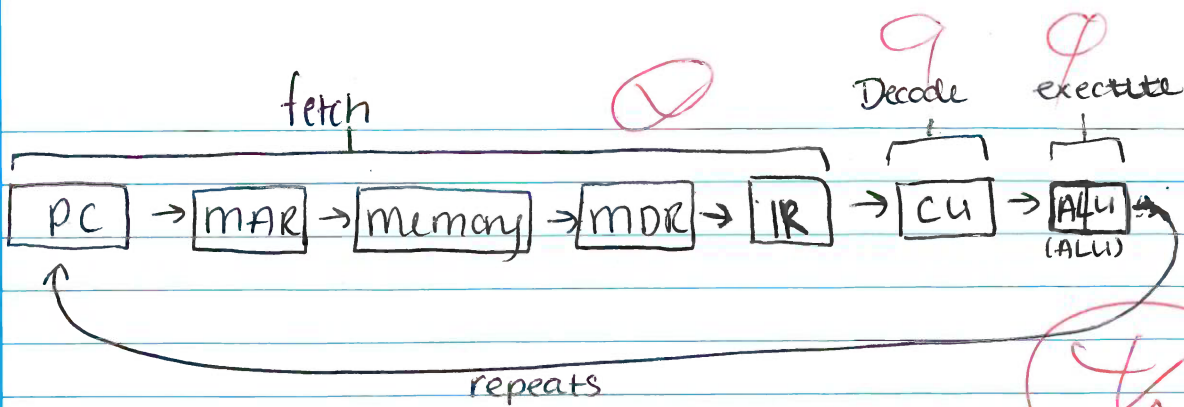
RAID 10

Disadvantage = Expensive due to a min. of 4 drives requirement.

advantage = very reliable for data @ not being lost easily.

b CFA

4) a.



Fetch:

- b. 1. PC (program counter) holds the address of the next instruction to be executed.
2. The address is then copied to MAR (Memory Address Register).
3. The control unit then sends a memory read signal via the control bus.
- ~~4. The data is then stored~~
4. The instruction is then stored in MDR (Memory Data Register) via the Data bus.
5. The instruction is then copied to the IR (Instruction register).
6. PC increments by 1.

Decode:

7. The CU then interprets the instruction using opcode and operand. The opcode ~~is~~ defines the operation needed to execute the instruction. The operand defines the data needed for the operation.

Execute:

8. The ALU (Arithmetic Logical Unit) then performs logical and Arithmetic calculations.

Store:

9. The results of the ALU is stored in the



(4b) ACC (Accumulator).

The cycle continuously repeats.

$\left[\frac{12}{18} \right]$

