



1 (a) Give **three** differences between Dynamic RAM (DRAM) and Static RAM (SRAM).

.....  
.....  
.....  
.....  
.....  
.....  
.....[3]

(b) (i) Examples of primary and secondary storage devices include:

- hard disk
- DVD-RW
- flash memory

For each device, describe the type of media used.

Hard disk .....

.....

DVD-RW .....

.....

Flash memory .....

.....[3]

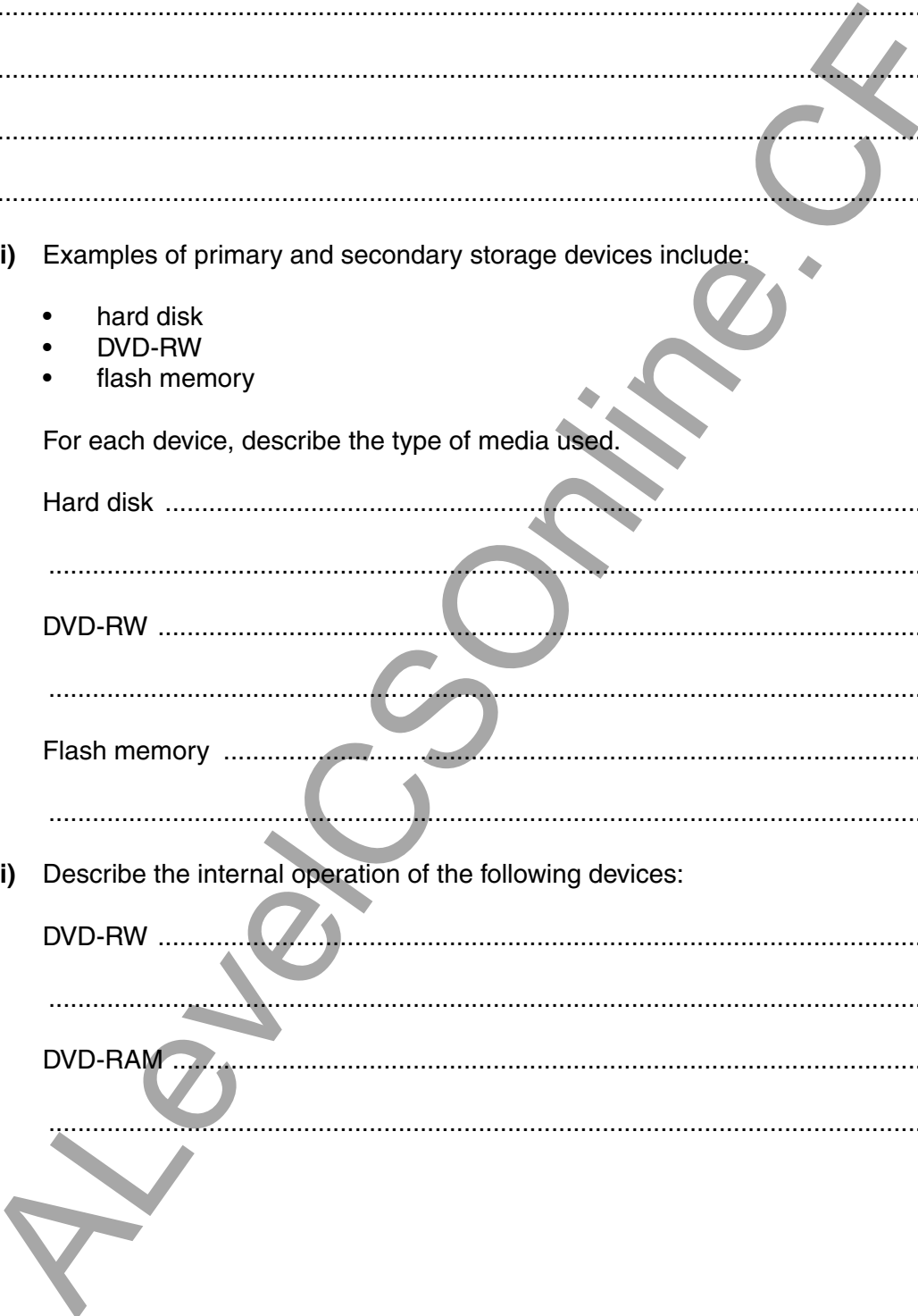
(ii) Describe the internal operation of the following devices:

DVD-RW .....

.....

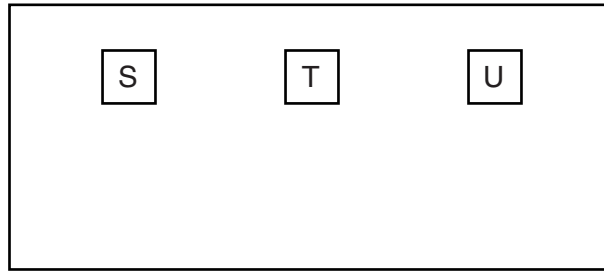
DVD-RAM .....

.....[2]





- 3 A touch screen has three squares where a selection can be made:



- (a) The x-coordinate of the centre of the three squares is held in three memory locations:

	Address	Memory contents
S	40	0000 1011 0100
T	41	0010 0101 0100
U	42	0100 0110 1100

- (i) Give the hexadecimal value of the memory contents for U.

.....  
 .....[1]

- (ii) Convert the denary number 40 into binary.

.....  
 .....[1]

(b) Bitmap graphics are used to represent squares S, T and U.

These can be saved in a number of different image resolutions.

(i) Give the number of bits required to store each pixel for a black and white bitmap.

.....[1]

(ii) Identify how many bits are required to store each pixel for a 256-colour bitmap.

Explain your answer.

.....  
.....  
.....[2]

(c) Images can be compressed to reduce file size.

(i) Describe how lossless compression techniques work.

.....  
.....  
.....  
.....[2]

(ii) Describe how lossy compression techniques work.

.....  
.....  
.....  
.....[2]

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- 5 Bobby is a senior programmer at a software house which produces intruder detection software. He also runs his own software company which develops and sells various computer applications.

The following table shows seven activities which Bobby carries out.

Put a tick (✓) in the appropriate column to identify if the activity is ethical or unethical.

Activity	Ethical	Unethical
gives away passwords used in the intruder detection software		
uses source code developed at the software house for the software he develops for his own company		
insists that staff work to deadlines		
turns down training opportunities offered by his employer		
writes and sells software that reads confidential data from client computers		
fakes test results of safety-critical software		
has the software applications developed overseas for sale in his own country		

[7]



- 6 (a) A student wrote the following logic statement:

X is 1 if (B is NOT 1 AND S is NOT 1) OR (P is NOT 1 AND S is 1)

Draw a logic circuit to represent the above logic statement.



[6]

- (b) Complete the truth table for this system.

B	S	P	Working space	X
0	0	0		
0	0	1		
0	1	0		
0	1	1		
1	0	0		
1	0	1		
1	1	0		
1	1	1		

[4]

- 7 (a) The string of characters, "BINARY CODE", was transmitted using 11 bytes of data. An additional byte, called the parity byte, was also transmitted.

Parity bytes can be used to identify exactly which bit has been transmitted incorrectly.

The table shows bit patterns for all 12 bytes after transmission. Even parity was used and the first bit is the parity bit.

	character	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7	bit 8
byte 1	B	0	1	0	0	0	0	1	0
byte 2	I	1	1	0	0	1	0	0	1
byte 3	N	0	1	0	0	1	1	1	0
byte 4	A	0	1	0	0	0	0	0	1
byte 5	R	1	1	0	1	0	0	1	0
byte 6	Y	0	1	1	1	1	0	0	1
byte 7		1	0	1	0	0	0	0	0
byte 8	C	1	1	0	0	0	0	1	1
byte 9	O	1	1	0	0	1	1	1	1
byte 10	D	0	1	0	0	0	1	0	0
byte 11	E	1	1	0	0	0	1	0	1
parity byte		0	0	1	0	0	0	1	0

- (i) There is one error in the transmission.

Indicate the byte number and bit number of the bit which has been incorrectly transmitted.

Byte number .....

Bit number ..... [2]

- (ii) Explain your answer to part (i).

.....  
 .....  
 .....  
 ..... [2]

(b) Verification and validation can be applied during data entry.

Describe what is meant by these terms. For each method, explain why it is needed.

Verification .....

.....  
.....  
.....

Validation .....

.....  
.....  
.....

[4]

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- 8 The table shows assembly language instructions for a processor which has one general purpose register – the Accumulator (ACC).

Instruction		Explanation
Op code	Operand	
LDD	<address>	Direct addressing. Load the contents of the given address to ACC
LDX	<address>	Index addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC
STO	<address>	Store the contents of ACC at the given address
INC	<register>	Add 1 to contents of the register (ACC or IX)
ADD	<address>	Add the contents of the given address to the ACC
END		Return control to the operating system

The diagram shows the contents of the memory:

main memory

100	0000 0010
101	1001 0011
102	0111 0011
103	0110 1011
104	0111 1110
105	1011 0001
106	0110 1000
107	0100 1011
	↓
200	1001 1110

- (a) (i) Show the contents of the Accumulator after execution of the instruction:

**LDD 102**

Accumulator:

--	--	--	--	--	--	--	--

[1]

(ii) Show the contents of the Accumulator after execution of the instruction:

**LDX 101**

Index register: 

0	0	0	0	0	1	0	0
---	---	---	---	---	---	---	---

Accumulator: 

--	--	--	--	--	--	--	--

Explain how you arrived at your answer.

.....  
 .....  
 .....  
 .....[3]

(iii) Show the contents of the Accumulator after execution of the instruction:

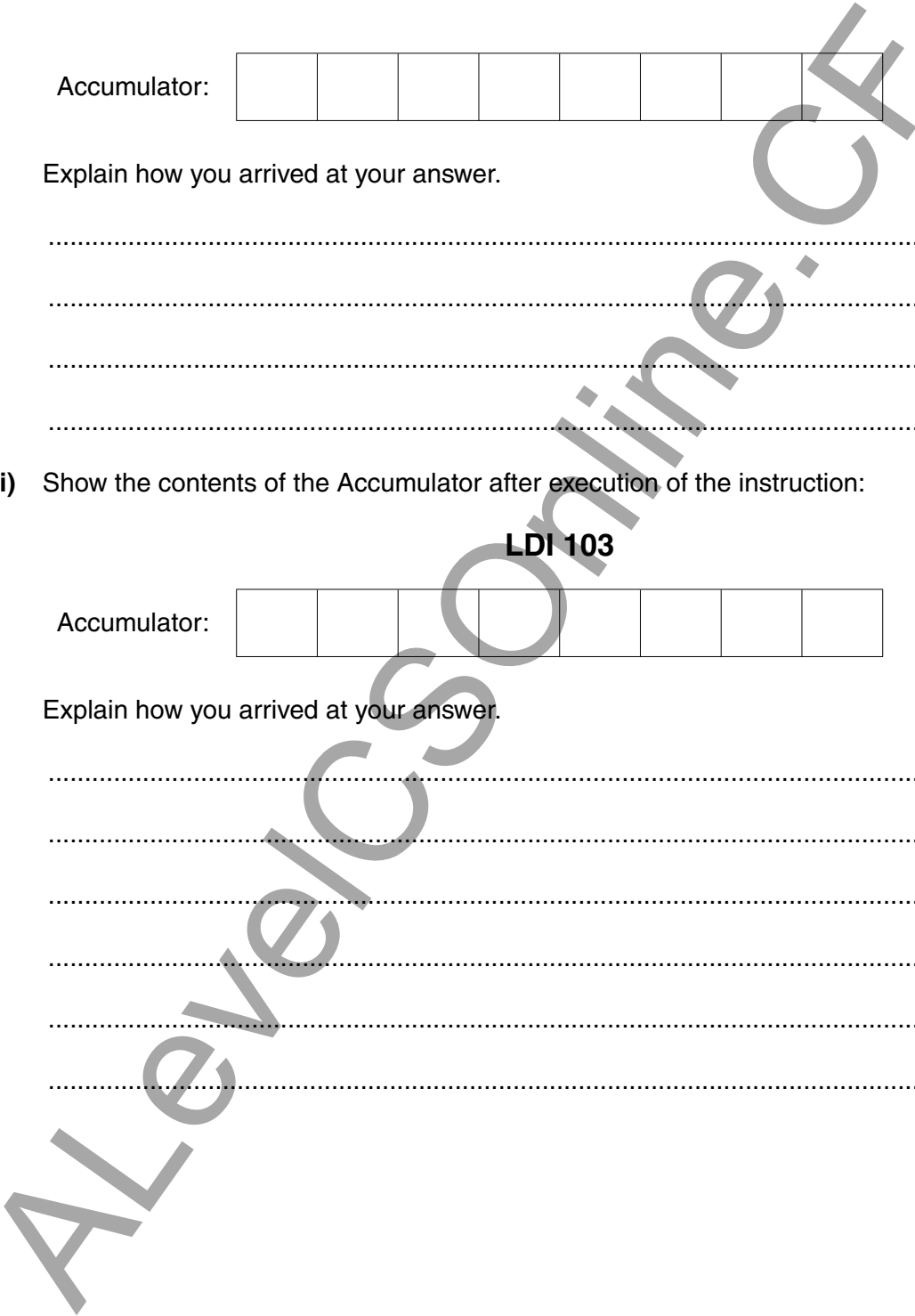
**LDI 103**

Accumulator: 

--	--	--	--	--	--	--	--

Explain how you arrived at your answer.

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....[4]



(b) Trace the assembly language program using the trace table.

```

800   LDD   810
801   INC
802   STO   812
803   LDD   811
804   ADD   812
805   STO   813
806   END
810   28
811   41
812   0
813   0

```

Trace table:

Accumulator	Memory address			
	810	811	812	813
	28	41	0	0

[6]

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