QUESTION 1.

9 A database has been designed to store data about salespersons and the product

The following facts help to define the structure of the database:

- each salesperson works in a particular shop
- each salesperson has a unique first name
- each shop has one or more salespersons
- each product which is sold is manufactured by one company only
- each salesperson can sell any of the products
- the number of products that each salesperson has sold is recorded

The table `ShopSales` was the first attempt at designing the database.

FirstName	Shop	ProductName	NoOfProducts	Manufacturer
Nick	TX	television set refrigerator digital camera	3 2 6	SKC WP HKC
Sean	BH	hair dryer electric shaver	1 8	WG BG
John	TX	television set mobile phone digital camera toaster	2 8 4 3	SKC ARC HKC GK

(a) State why the table is **not** in First Normal Form (1NF).

.....

.....[1]

(b) The database design is changed to:

SalesPerson (FirstName, Shop)

SalesProducts (FirstName, ProductName, NoOfProducts, Manufacture

Using the data given in the first attempt table (ShopSales), show how these data are now stored in the revised table designs.

Table: SalesPerson

FirstName	Shop

Table: SalesProducts

FirstName	ProductName	NoOfProducts	Manufacturer

[3]

QUESTION 2.

7 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 contents of given address to ACC
STO	<address>	Store the contents of ACC at the given address
LDI	<address>	Indirect addressing. The address to be used is at the given address. Load the contents of this second address to ACC
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC
INC	<register>	Add 1 to contents of the register (ACC)
JMP	<address>	Jump to the given address
END		Return control to operating system

The diagram shows the contents of the memory.

Main memory

120	0 0 0 0 1 0 0 1
121	0 1 1 1 0 1 0 1
122	1 0 1 1 0 1 1 0
123	1 1 1 0 0 1 0 0
124	0 1 1 1 1 1 1 1
125	0 0 0 0 0 0 0 1
126	0 1 0 0 0 0 0 1
127	0 1 1 0 1 0 0 1
≀	≀
200	1 0 0 0 1 0 0 0

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

LDD 121

Accumulator:								

[1]

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

LDI 124

Accumulator:								

Explain how you arrived at your answer.

.....

.....

.....

..... [3]

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

LDX 120

Index Register:	0	0	0	0	0	1	1	0

Accumulator:								

Explain how you arrived at your answer.

.....

.....

.....

..... [3]

QUESTION 3.

11 A game program is written which can be either interpreted or compiled. The table below shows five statements about the use of interpreters and compilers.

Tick (✓) to show whether the statement refers to an interpreter or to a compiler.

Statement	Interpreter	Compiler
This translator creates an executable file		
When this translator encounters a syntax error, game execution halts		
The translator analyses and checks each line just before executing it		
This translator will produce faster execution of the game program		
Use of this translator makes it more difficult for the user to modify the code of the game		

[5]

(b) **(i)** A black and white image is 512 pixels by 256 pixels.

Calculate the file size of this image in kilobytes (KB) (1 KB = 1024 bytes).
Show your working.

.....

.....

.....

.....

.....[2]

(ii) Give a reason why it is important to estimate the file size of an image.

.....

.....

.....[1]

9 **(a)** Give a brief description of each of the following terms:

Validation .....

.....

.....

Verification .....

.....

.....[2]

(b) Data are to be transferred between two devices. Parity checks are carried out on the data.

Explain what is meant by a parity check. Give an example to illustrate your answer.

.....

.....

.....

.....

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.....

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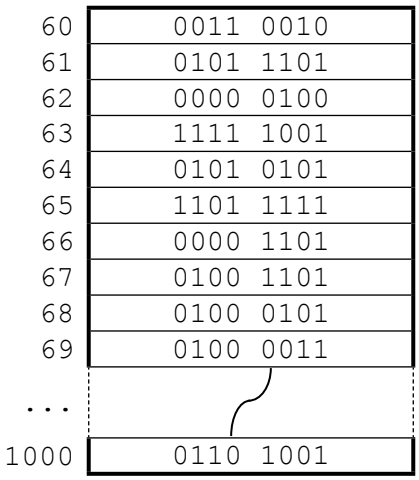
.....[4]

QUESTION 4.

9 The table shows assembly language instructions for a processor which has one general purpose register, the Accumulator (ACC) and an index register (IX).

Instruction		Explanation
Op code	**Operand**	
LDD	<address>	Direct addressing. Load the contents of the given address to ACC.
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC.
STO	<address>	Store contents of ACC at the given address.
ADD	<address>	Add the contents of the given address to ACC.
INC	<register>	Add 1 to the contents of the register (ACC or IX).
DEC	<register>	Subtract 1 from the contents of the register (ACC or IX).
CMP	<address>	Compare contents of ACC with contents of <address>.
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True.
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False.
JMP	<address>	Jump to the given address.
OUT		Output to screen the character whose ASCII value is stored in ACC.
END		Return control to the operating system.

(a) The diagram shows the current contents of a section of main memory and the index register:



Index register:

0	0	0	0	1	0	0	0

(i) Show the contents of the Accumulator after the execution of the instruct

```
LDX 60
```

Accumulator: | | | | | | | | |

Show how you obtained your answer.

.....

.....

.....

.....[2]

(ii) Show the contents of the index register after the execution of the instruction:

```
DEC IX
```

Index register: | | | | | | | | |

[1]

(b) Complete the trace table on the opposite page for the following assembly lan

50	LDD 100
51	ADD 102
52	STO 103
53	LDX 100
54	ADD 100
55	CMP 101
56	JPE 58
57	JPN 59
58	OUT
59	INC IX
60	LDX 98
61	ADD 101
62	OUT
63	END
...	
100	20
101	100
102	1
103	0

IX (Index Register)	1

Selected values from the ASCII character set:

ASCII Code	118	119	120	121	122	123	124	125
Character	v	w	x	y	z	{	|	}

Trace table:

Instruction address	Working space	ACC	Memory address				IX	OUTPUT
			100	101	102	103		
			20	100	1	0	1	
50								
51								
52								
53								
54								
55								

[7]

QUESTION 5.

7 A bank holds personal data about its customers and their financial data.

(a) Describe the difference between security and integrity of data.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(b) Describe **three** security measures that the bank could implement to protect its electronic data.

Security measure 1 .....

Description .....

.....

.....

Security measure 2 .....

Description .....

.....

.....

Security measure 3 .....

Description .....

.....

.....[6]

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QUESTION 6.

8 The table shows assembly language instructions for a processor which has one g
register, the Accumulator (ACC) and an Index Register (IX).

Instruction		Explanation
Op code	**Operand**	
LDD	<address>	Direct addressing. Load the contents of the given address to ACC.
LDX	<address>	Indexed addressing. Form the address from <address> + the contents of the index register. Copy the contents of this calculated address to ACC.
STO	<address>	Store contents of ACC at the given address.
ADD	<address>	Add the contents of the given address to ACC.
CMP	<address>	Compare contents of ACC with contents of <address>
JPE	<address>	Following a compare instruction, jump to <address> if the compare was True.
JPN	<address>	Following a compare instruction, jump to <address> if the compare was False.
JMP	<address>	Jump to the given address.
OUT		Output to the screen the character whose ASCII value is stored in ACC.
END		Return control to the operating system.

The diagram shows the contents of the main memory:

Main memory

800	0110 0100
801	0111 1100
802	1001 0111
803	0111 0011
804	1001 0000
805	0011 1111
806	0000 1110
807	1110 1000
808	1000 1110
809	1100 0010
:	
2000	1011 0101

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

```
LDD  802
```

Accumulator: | | | | | | | | |

[1]

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

```
LDX 800
```

Index Register:	0	0	0	0	1	0	0	1
Accumulator:								

Explain how you arrived at your answer.

.....

.....

.....

.....[3]

(b) (i) Complete the trace table below for the following assembly language program contains denary values.

100	LDD 800
101	ADD 801
102	STO 802
103	LDD 803
104	CMP 802
105	JPE 107
106	JPN 110
107	STO 802
108	OUT
109	JMP 112
110	LDD 801
111	OUT
112	END
:	
800	40
801	50
802	0
803	90

Selected values from the ASCII character set:

ASCII code	40	50	80	90	100
Character	(	2	P	Z	d

Trace table:

ACC	Memory address				OUTPUT
	800	801	802	803	
	40	50	0	90	

[4]

(ii) There is a redundant instruction in the code in **part (b)(i)**.

State the address of this instruction.

.....

(c) The program used the ASCII coding system for character codes. An alternative coding system is Unicode.

(i) Give **two** disadvantages of using ASCII code.

1 .....

.....

2 .....

.....[2]

(ii) Describe how Unicode is designed to overcome the disadvantages of ASCII.

.....

.....

.....

.....[2]

BLANK PAGE

BLANK PAGE

QUESTION 7.

9 A health club offers classes to its members. A member needs to book into each c

(a) The health club employs a programmer to update the class booking system. The p has to decide how to store the records. The choice is between using a relational dat a file-based approach.

Give **three** reasons why the programmer should use a relational database.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

3 .....

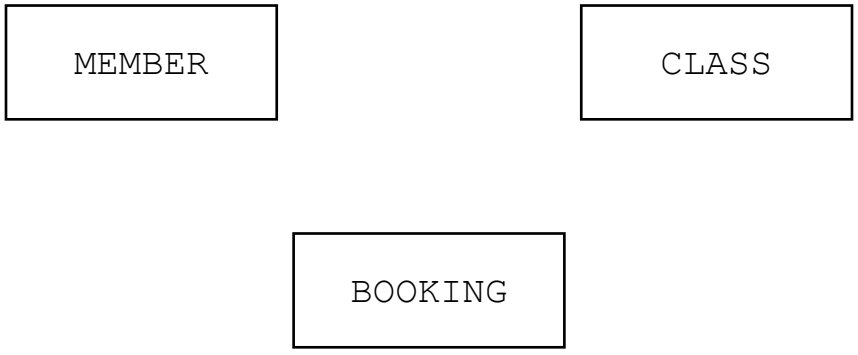
.....

.....

.....[6]

(b) The programmer decides to use three tables: `MEMBER`, `BOOKING` and `CLASS`.

Complete the Entity-Relationship (E-R) diagram to show the relationships between these tables.



[2]

QUESTION 8.

7 The design of a web-based application can require the use of client-side scripting.

(a) Describe what is meant by **client-side scripting**.

.....

.....

.....

.....[2]

(b) A user requests a web page by keying the Uniform Resource Locator (URL) into the address bar of their web browser.

The requested page contains a client-side script.

Describe the sequence of steps leading to the display of the web page on the computer screen.

.....

.....

.....

.....

.....

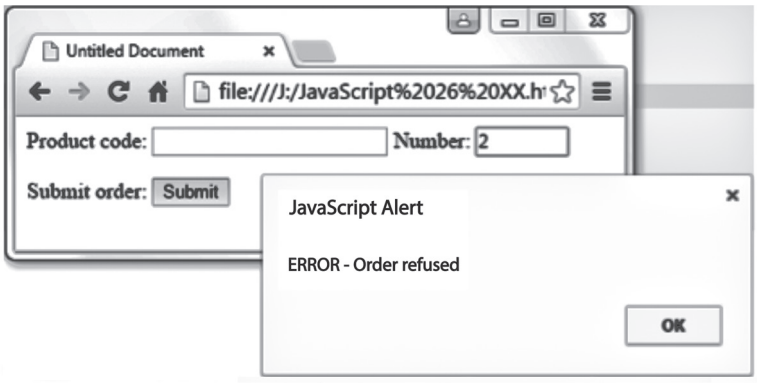
.....

.....

.....[4]

(c) A web page used for data capture consists of:

- two text boxes for the entry of:
  - a product code
  - the number of items to be purchased.
- a button which is clicked when the user wants to submit this order.



Study the following web page.

```
1  <html>
2  <head>
3  <title>Untitled Document</title>
4  <script language="JavaScript">
5
6  function myButton_onmousedown()
7  {
8  var Message1 = "ERROR - Order refused";
9  var Message2 = "Product code OK";
10 var x = document.forms["form1"]["txtProductCode"].value;
11     if (x == "")
12     {
13         alert(Message1)
14     }
15     else
16     {
17         alert(Message2)
18     }
19 }
20 </script>
21
22 </head>
23 <body>
24 <form name = form1>
25   <label>Product code: </label>
26   <input type="text" name="txtProductCode" >
27   <label>Number: </label>
28   <input type="text" name="txtNumber" size = "5" >
29   <p>
30     <label>Submit order: </label>
31     <input type="button" name="btnSubmit" Value = "Submit"
32
33     onMouseDown = "myButton_onmousedown()" >
34   </p>
35 </form>
36
37 </body>
38 </html>
```

(i) The developer has used three variables in the JavaScript code. State the

1 .....

2 .....

3 ..... [2]

(ii) The button has an event whose identifier is `onMouseDown`. When the submit button is clicked, some code is executed.

State the line numbers that contain this code.

From line ..... to line ..... [1]

(iii) The JavaScript code uses a selection statement.

State the line number that contains the condition.

Line number: ..... [1]

(iv) Describe the purpose of the validation check that the code performs.

.....

.....[1]

(v) Name and describe **two** other types of validation check that could be appropriate for this data capture form.

Validation check: .....

Description .....

.....

Validation check: .....

Description .....

.....

[4]

QUESTION 9.

6 Downloading a file from a website is an example of a client-server application.

(a) Describe what is meant by the term **client-server** for this application.

.....

.....

.....

.....[2]

(b) The following sequence of steps (1 to 5) describes what happens when someone uses their personal computer (PC) to request a web page. The web page consists of HTML tags and text content only. Four of the statements from **A**, **B**, **C**, **D**, **E** and **F** are used to complete the sequence.

A	Browser software interprets the script, renders the page and displays.
B	Browser software renders the page and displays.
C	Browser software compiles the script, renders the page and displays.
D	The web server retrieves the page.
E	The Domain Name Service (DNS) uses the domain name from the browser to look up the IP address of the web server.
F	The web server sends the web page content to the browser.

Write one of the letters A to F in the appropriate row to complete the sequence.

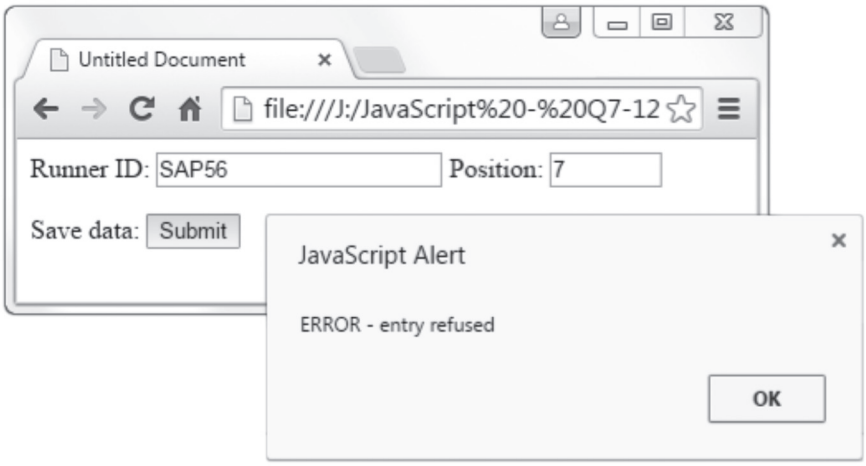
1. The user keys in the Uniform Resource Locator (URL) into the browser software.
2. .....
3. .....
4. .....
5. .....

[4]

Question 6(c) begins on the next page.

(c) The following web page used for data capture consists of:

- two text boxes for the entry of:
  - a race runner's ID code
  - their finishing position in a race.
- a button that the user clicks to submit this runner's result.




```
 <html>
<head>
<title>Untitled Document</title>
<script language="JavaScript">

function myButton_onmousedown()
{
var Output1 = "Runner ID OK";
var Output2 = "ERROR - entry refused";

var Runner ID = document.forms["form1"]["txtRunnerID"].value;
//                                  || in Javascript is the 'OR' operator
if (RunnerID.substr(0,3) == "VAR" || RunnerID.substr(0,3) == "CAM")
{
          alert(Output1)
    }
    else
    {
          alert(Output2)
    }
}
</script>

</head>
<body>
<form name = form1>
  <label>Runner ID: </label>
  <input type="text" name="txtRunnerID" >
  <label>Position: </label>
  <input type="text" name="txtPosition" size = "5" >
  <p>
    <label>Save data: </label>
    <input type="button" name="btnSubmit" Value = "Submit"

    onMouseDown = "myButton_onmousedown()" >
  </p>
</form>

</body>
</html>
```

(i) The developer has used three variables in the JavaScript code. Sta used.

1. .....

2. .....

3. ..... [2]

(ii) The button has an event whose identifier is `onMouseDown`. When the mouse button is clicked, some code is run.

State the line numbers which contain this code.

From line ..... to line ..... [1]

(iii) The JavaScript code uses a selection statement.

State the line number which contains its condition.

Line number: ..... [1]

(iv) Describe the purpose of the validation check that the code performs.

.....

.....[1]

(v) Name and describe **two** other types of validation check which could be appropriate for this data capture form.

Validation check: .....

Description .....

.....

Validation check: .....

Description .....

.....

[4]

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QUESTION 10.

7 A clinic is staffed by several doctors. The clinic serves thousands of patients. Eac
one time, there is only one doctor in the clinic available for appointments.

The clinic stores patient, doctor and appointment data in a relational database.

(a) (i) Underline the primary key for each table in the following suggested table designs.

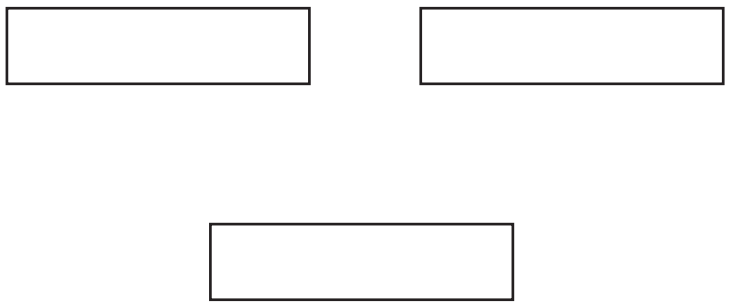
```
PATIENT(PatientID, PatientName, Address, Gender)

DOCTOR(DoctorID, Gender, Qualification)

APPOINTMENT(AppointmentDate, AppointmentTime, DoctorID, PatientID)
```

[2]

(ii) Complete the following entity-relationship (E-R) diagram for this design.



[2]

(b) The doctors are concerned that many patients make appointments but do not attend them.

Describe the changes to the table designs that could be made to store this information.

.....

.....[2]

(c) The doctors are about to set up a new clinic in the neighbouring village, SITE-B.

The original location is identified as SITE-A.

A new table is designed to store the ID of the doctor who is able to work at each site.

DOCTOR-AVAILABILITY(DoctorID, Site)

Five entries stored in the table are:

DoctorID	Site
098	SITE-A
074	SITE-A
117	SITE-B
098	SITE-B
033	SITE-B

(i) State what this data shows about the availability of the doctor with the ID of 098.

.....

.....[1]

(ii) Opening a new clinic in the neighbouring village will not require any additional table for storing appointments. It will need a change to the existing appointment table design.

Show the revised APPOINTMENT table.

APPOINTMENT(.....

.....) [1]

(d) The doctor with the ID of 117 has recently been allocated a new DoctorID of 017.

(i) Write an SQL script to update this doctor's record in the database.

UPDATE .....

SET.....

WHERE .....

[3]

(ii) Describe why this update could cause problems with the existing data stored.

.....

.....

.....[2]

QUESTION 11.

7 A company takes customer service for its clients very seriously.

The client

- The client names are unique.

A visit

- The company arranges a date for a visit to gather feedback from a client.
- A visit to a client never takes more than one day.
- Over time, the client receives many visits.

Staff (Interviewers)

- One or more staff attend the visit.
- If there is more than one staff member visiting, each performs a separate interview.

Interviews

- Each interview is classified as either 'general' or by some specialism, for example, marketing, customer service or sales.
- A report is produced for each interview, `InterviewText`.
- Each interview is conducted by a single staff member.

The client, visit, staff and interview data will be stored in a relational database.

(a) (i) Underline the primary key for each table in the following suggested table designs.

```
STAFF(StaffID, StaffName, Department)

CLIENT(ClientName, Address, Town)

VISIT(ClientName, VisitDate)

INTERVIEW(ClientName, VisitDate, StaffID, SpecialistFocus, InterviewText)
```

[3]

(ii) For each of the pairs of entities, A, B and C, draw the relationship between the two entities.

A | CLIENT | VISIT |

B | VISIT | INTERVIEW |

C | INTERVIEW | STAFF |

[3]

QUESTION 12.

7 A movie theatre has a relational database that stores the movie schedule, and i
the movies. The theatre has several screens that play movies at the same time.

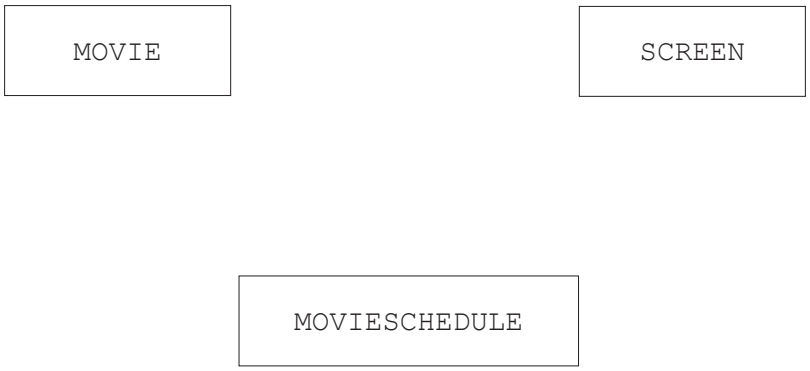
The database has three tables to store information about the movies, the screens and t
schedule.

MOVIE(MovieID, Title, Length, Rating)

SCREEN(ScreenNumber, NumberSeats)

MOVIESCHEDULE(ScheduleID, MovieID, ScreenNumber, Time)

(a) Complete the entity-relationship (E-R) diagram to show the relationships between these tables.



[2]

(b) Explain how primary and foreign keys are used to link the tables in the movie theatre database.

.....

.....

.....

.....

.....

.....

.....[4]

(c) The database needs to store the name of the company that produced example, `Rocking Movies`.

Write an SQL script to add the attribute `ProductionCompany` to the `MOVIE` table.

.....

.....

.....

.....

.....[2]

(d) Write an SQL script to display the title and rating of all movies scheduled to play on screen number 3.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[4]

QUESTION 13.

6 Kim is using her laptop computer to write a program in a high-level language.

(a) Kim needs to make sure the program is secure against unauthorised access. She has already set up a username and password on her laptop.

Identify **two** additional electronic measures that Kim can use to keep the program secure.

1 .....

2 .....
[2]

(b) Kim will use library routines in her program.

(i) Describe what is meant by a **library routine**.

.....

.....

.....

..... [2]

(ii) Describe **one** benefit and **one** drawback of using library routines.

Benefit .....

.....

.....

.....

Drawback .....

.....

.....

.....

[4]

(c) Kim develops her program and makes it ready for use. To do this, she uses first an interpreter and then a compiler.

Explain why Kim needs to use both an interpreter and a compiler.

Interpreter .....

.....

.....

.....

Compiler .....

.....

.....

.....

[4]

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QUESTION 14.

6 A student records a video using a digital camera.

(a) The recording uses interlaced encoding.

Describe **interlaced encoding**.

.....

.....

.....

.....

.....

.....

..... [3]

(b) State **one** benefit of using interlaced encoding compared to progressive encoding.

.....

..... [1]

(c) A video can be compressed using spatial redundancy or temporal redundancy.

Explain how **temporal redundancy** compresses a video.

.....

.....

.....

.....

..... [2]

(d) A sound track is recorded for the video.

(i) Describe how a computer encodes the sound track.

.....

.....

.....

.....

.....

..... [3]

(ii) Explain how the sampling rate and sampling resolution affect the file s
track.

Sampling rate .....

.....

Sampling resolution .....

.....

[2]

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QUESTION 15.

6 Dominic uses a tablet computer to complete work. He records videos of his wo
colleagues to watch at a later date.

(a) The tablet computer has input and output devices.

(i) The table lists four devices built into the tablet.

Tick (✓) one or more boxes for each device to identify whether it is an input device, an output device or both.

Device	Input	Output
Touchscreen		
Webcam		
Microphone		
Fingerprint scanner		

[2]

5 Mica has created some software and has copyrighted it. She wants to stop other people from copying and changing it illegally.

(a) Identify **two** ways Mica can prevent illegal copies of the software being installed.

1 .....

.....

2 .....

.....
[2]

(b) Identify **one** way Mica can distribute the software without the source code.

.....

..... [1]

(c) Mica is releasing the software under a commercial licence.

(i) Give **two** benefits to Mica of using a commercial licence.

1 .....

.....

2 .....

.....
[2]

(ii) Name **two** other types of software licence.

1 .....

.....

2 .....

.....
[2]

QUESTION 16.

7 The following table has descriptions of modes of addressing.

Complete the table by writing the name of the addressing mode for each description.

Addressing mode	Description
	Form the address by adding the given number to a base address. Load the contents of the calculated address to the Accumulator (ACC).
	Load the contents of the address held at the given address to ACC.
	Load the contents of the given address to ACC.
	Form the address from the given address + the contents of the Index Register. Load the contents of the calculated address to ACC.
	Load the given value directly to ACC.

[5]

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