Attempt Section I and Section II and one Part of Section III.

Section I – Attempt all questions.

Section II – Attempt all questions.

Section III – This section has three parts:

  Part A – Applied Multimedia
  Part B – Expert Systems
  Part C – The Internet

Choose one part and answer all of the questions in that part.

Read each question carefully.

Write your answers in the answer book provided. Do not write on the question paper.

Write as neatly as possible.

Answer in sentences wherever possible.
1. Explain what is meant by the term *information rich*.  

2. The following spreadsheet is used for calculating a person’s body mass index (BMI).

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>BMI Calculator</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Name</strong></td>
<td><strong>Weight (kg)</strong></td>
<td><strong>Height (m)</strong></td>
<td><strong>BMI</strong></td>
</tr>
<tr>
<td>3</td>
<td>Nafeesa</td>
<td>60·3</td>
<td>1·80</td>
<td>=B3/(C3*C3)</td>
</tr>
<tr>
<td>4</td>
<td>Rhys</td>
<td>69·9</td>
<td>1·62</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>John</td>
<td>52·2</td>
<td>1·51</td>
<td></td>
</tr>
</tbody>
</table>

(a) Cell D3 contains the formula that calculates the BMI. Describe an efficient method of getting the formula into the other two cells in the column.  

(b) State the object in a database that is the equivalent of a row in a spreadsheet.  

(c) Nafeesa’s weight is shown in the spreadsheet as 60·3. Explain why this is *information* and not *data*.  

3. Jason uses software that allows him to add and delete slides, insert sounds, graphics and hyperlinks. State the type of software that Jason is using.  

4. Explain what is meant by *Information Intellectual Property Rights*.  

5. Explain what is meant by the term *foreign key*.  

6. When creating a database, explain when you would use an *object* field type.
7. Shown below is a small part of a database about facial features.

<table>
<thead>
<tr>
<th>Hair Colour</th>
<th>Eye Colour</th>
<th>Other Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>Blue</td>
<td>Beard, moustache, scar</td>
</tr>
<tr>
<td>Grey</td>
<td>Blue</td>
<td>Beauty Spot</td>
</tr>
<tr>
<td>Grey</td>
<td>Brown</td>
<td>None</td>
</tr>
<tr>
<td>Black</td>
<td>Green</td>
<td>Beard</td>
</tr>
</tbody>
</table>

(a) From the database, identify a multi-valued field.  
(b) State the term used to describe the removal of multi-valued fields.  
(c) Redraw the table as it would look if it was sorted on Hair colour in ascending order and Eye colour in ascending order.

8. Health and Safety regulations regarding the use of computers have a section covering RSI.

(a) State what RSI stands for.  
(b) Describe what the Health and Safety regulations might suggest to prevent RSI from occurring.

Total for Section I (15)
9. Kino run a chain of cinemas across the country. Their information system provides details about upcoming movies and film reviews. It also allows users to buy tickets online.

(a) When a new customer uses the information system for the first time, the following screen is displayed.

(i) Identify the function of this form in the information system.

(ii) Several fields on the form are marked with * to indicate a required field. Describe how this validation would have been implemented when the system was created.

(iii) The form uses a range of HCI features.

(A) Name the HCI feature used on the form for the Favourite cinema fields.

(B) Describe one benefit of using this feature in a form.
9. (continued)

(b) When registering their personal data, customers are asked to read and accept the Terms and Conditions. Here is an extract from this document.

**Terms and Conditions**

1. Privacy policy
   We want you to feel confident about the privacy and security of your personal information when using our system. Our policy sets out the basis on which any personal data that you provide to us will be stored and processed.

2. Reasons for processing information
   We process personal information lawfully to enable us to promote our goods and services, to maintain our accounts and records, and to support and manage our customers.

3. Type of personal information processed
   We collect relevant personal information from you and process your personal information when you register yourself on our system, book cinema tickets, post reviews or make other purchases via our information system.

(i) (A) Name the piece of legislation that Kino must comply with when storing and processing personal information.

(B) Items 2 and 3 in the Terms and Conditions relate directly to principles of the law. Describe **one** other principle of this law that Kino should address in the Terms and Conditions.

(ii) Describe **two** techniques Kino could employ as part of a security strategy to ensure the security of personal information.

(c) Film reviews are included in the information system as shown below.

<table>
<thead>
<tr>
<th>Film Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>12 Years A Slave</td>
<td>Picking up the Oscar for Best Picture, this extremely moving and heartfelt story is difficult to watch at times, tells the true story of Solomon Northup sold into a life of slavery.</td>
</tr>
<tr>
<td>The Wolf of Wall Street</td>
<td>Leonardo DiCaprio stars as the New York stockbroker whose monstrous rise from dealing in small time shares to a life of corruption in the late 80s earns him the title of the Wolf of Wall Street.</td>
</tr>
<tr>
<td>Captain Phillips</td>
<td>Starring two time Oscar winner, Tom Hanks as Captain Richard Phillips, the film tells the story of the hijacking of MV Maersk Alabama cargo ship by Somali pirates.</td>
</tr>
<tr>
<td>Gravity</td>
<td>This 3D British science fiction thriller and space drama tells the story of a medical engineer and an astronaut working together to survive being cast adrift in orbit.</td>
</tr>
</tbody>
</table>

The font, size and style selected match the company style used throughout all their publications. Apart from text styling, identify **two** other formatting features used in the creation of this document.
10. The International Association of Athletics Federations (IAAF) is the international governing body for the sport of World Athletics. The IAAF stores details about its member associations and their member countries. Some of the data is shown below.

<table>
<thead>
<tr>
<th>Area Association</th>
<th>EAA</th>
<th>Association Logo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area Name</td>
<td>European Athletic Association</td>
<td></td>
</tr>
<tr>
<td>Formation</td>
<td>1932</td>
<td></td>
</tr>
<tr>
<td>Headquarters</td>
<td>Lausanne, Switzerland</td>
<td></td>
</tr>
<tr>
<td>Member countries</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Area President</td>
<td>Hansjörg Wirz</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Member Country</th>
<th>Country Association</th>
<th>Title</th>
<th>Headquarters</th>
<th>Founded</th>
<th>Affiliation</th>
<th>President</th>
</tr>
</thead>
<tbody>
<tr>
<td>France</td>
<td>FFA</td>
<td>Fédération Française D’Athlétisme</td>
<td>Paris</td>
<td>1920</td>
<td>1912</td>
<td>Bernard Amsalem</td>
</tr>
<tr>
<td>Poland</td>
<td>PZLA</td>
<td>Polski Związek Lekkiej Atletyki</td>
<td>Warsaw</td>
<td>1919</td>
<td>1921</td>
<td>Jerzy Skucha</td>
</tr>
<tr>
<td>Italy</td>
<td>FIDAL</td>
<td>Federazione Italiana di Atletica Leggera</td>
<td>Rome</td>
<td>1906</td>
<td>1913</td>
<td>Alfio Giomi</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>UKA</td>
<td>UK Athletics</td>
<td>Birmingham</td>
<td>1999</td>
<td></td>
<td>Lynn Davies</td>
</tr>
<tr>
<td>Croatia</td>
<td>HAS</td>
<td>Hrvatski Atletski Savez</td>
<td>Zagreb</td>
<td>1992</td>
<td>1992</td>
<td>Luciano Sušanj</td>
</tr>
<tr>
<td>Spain</td>
<td>RFEA</td>
<td>Real Federación Española de Atletismo</td>
<td>Madrid</td>
<td>1920</td>
<td>1918</td>
<td>José María Odriozola</td>
</tr>
</tbody>
</table>

A relational database is recommended for storing this data.

(a) State **two** advantages of a relational database over a flat file database.

(b) Identify and remove the multi-valued fields from the table above and represent the data as two entities with suitable names. Identify all primary and foreign keys.

(c) The IAAF would like to add the website address for each member country. State the most appropriate field type for this field.
[Turn over for Question 11 on Page eight

DO NOT WRITE ON THIS PAGE
11. The school canteen at Forthview High School provides lunches and snacks for pupils. Each pupil is issued with a card which they can top up with cash and then use to buy items at breaktime or lunchtime.

The canteen system includes 4 terminals for pupils to top up their cards and check their balance, 6 point of sale terminals and a server which stores the product details and the pupil details.

(a) Identify two costs involved in setting up the system in the school.

(b) Identify the method of input used in the system:
   (i) By canteen staff when recording purchases.
   (ii) By pupils when paying for purchases.

(c) The school finds this system is more efficient than handling cash at the point of sale. Give two reasons why this is more efficient.
11. (continued)

(d) The canteen system stores each transaction processed during the day at the time it occurred.

The table below shows part of the list of transactions for one day.

<table>
<thead>
<tr>
<th>List of Transactions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Time stamp</td>
</tr>
<tr>
<td>10:20</td>
</tr>
<tr>
<td>10:21</td>
</tr>
<tr>
<td>10:21</td>
</tr>
<tr>
<td>12:15</td>
</tr>
<tr>
<td>12:15</td>
</tr>
<tr>
<td>12:16</td>
</tr>
<tr>
<td>12:16</td>
</tr>
<tr>
<td>12:18</td>
</tr>
<tr>
<td>12:18</td>
</tr>
<tr>
<td>12:20</td>
</tr>
<tr>
<td>12:20</td>
</tr>
<tr>
<td>12:22</td>
</tr>
</tbody>
</table>

(i) At the end of each day, the canteen supervisor can use the information in the system to carry out data analysis and produce reports. Describe one reason why the canteen supervisor might want to analyse the information. 1

(ii) The parent of a first year pupil is concerned about what their child is eating at school and requests a report showing the items bought since the beginning of the month using card ID 10876.

(A) Explain why the cardID is used and not the pupil name. 1

(B) Describe what the supervisor will need to do to produce a suitable report for the parent. 2

Total for Section II (30)
[BLANK PAGE]

DO NOT WRITE ON THIS PAGE
SECTION III

Attempt ONE part of Section III.

Part A  Applied Multimedia  Page 12  Questions 12 to 14
Part B  Expert Systems  Page 18  Questions 15 to 17
Part C  The Internet  Page 23  Questions 18 to 21

Choose one part and answer all of the questions in that part.
12. Sportland is creating a multimedia application.

(a) State one business use for a multimedia application.  

(b) State two benefits of using a DVD-ROM as the delivery media rather than a CD-ROM.  

(c) During the analysis stage the user of the application should be considered.  
Describe two factors about the user that should be considered.  

(d) The navigation map for the Sportland application is shown below:

State the type of navigation structure used in this application.
12. (continued)

(e) Emily creates the graphics, video and audio for use in the application.

(i) State Emily’s job title.  

(ii) Emily asks her project manager to ensure that the following statement is included in the application.

“All rights, including copyright, in the content of this Sportland application are owned or controlled for these purposes by Sportland. In accessing the multimedia application, you agree that you may only download the content for your own personal non-commercial use.”

Explain why Emily wishes this notice to be added.
13. A multimedia kiosk is being designed to be used by tourists in Scottish cities.

(a) A storyboard for one of the screens is shown below:

(i) Identify the part of the storyboard which is shown in grey.  

(ii) Identify an anchor which appears on this storyboard. 

(iii) State one audio design principle which has been considered when creating this storyboard. 

(iv) Explain the purpose of a transition.
13. (continued)

(b) The “Caledonia” soundtrack is being recorded. Both the sampling rate and sampling depth have to be decided.

(i) Explain what is meant by the term sampling depth.

(ii) The soundtrack is saved at different sampling rates as shown below

Explain why File A would have a better audio quality than File B.

(c) Some of the screens involve the creation of programming code to add additional functionality.

State the most appropriate type of software for creating the multimedia kiosk.

(d) When the implementation stage is complete the kiosk is tested. An extract from the initial testing is shown below

<table>
<thead>
<tr>
<th></th>
<th>Aberdeen</th>
<th>Dundee</th>
<th>Edinburgh</th>
<th>Glasgow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do all the links within the page work correctly?</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Do all of the video links work correctly?</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td>Do all the buttons work correctly?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Are there any broken links?</td>
<td>✓</td>
<td>✓</td>
<td>✗</td>
<td>✗</td>
</tr>
<tr>
<td>Is there a smooth and consistent transition between screens?</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

State the type of testing which is being carried out using the extract above.
A multimedia application is created with information on Scottish charities.

(a) The Welcome screen of the application is shown below:

(i) Identify one data object from the Welcome screen

(ii) The image of the thistle is changed to lower the file size. The result of this change is shown below.

![Original](image1.png) ![Edited Version](image2.png)

Describe the change that has been made to lower the file size of the edited version.
(b) The HCI for the multimedia application is shown in more detail below:

(i) Identify the type of user interface being used by the application.  
(ii) Identify an HCI feature used in this multimedia application.  
(iii) Explain why the World Wide Web (WWW) would be the most suitable medium for delivering this multimedia application.  

(c) A page in the multimedia application contains the following text.

State the name of the user documentation shown above.  

(d) A report is created about the multimedia application which contains the following extract.

“The multimedia application meets the requirements of the original specification. It has features to add, delete and update charity entries. Therefore, the application will be easy to maintain since the charities themselves will carry out the work.”

State the stage in the development process at which this report has been created.  

Total for Section III Part A (25)
15. TakeitEasy is a holiday company using an expert system to help customers decide where to go on holiday. Some of the rules from the expert system are shown below:

Rule 1 IF price range IS expensive
    AND likely weather IS hot
    AND activities ARE scuba diving
    THEN destination IS Barbados.

Rule 2 IF price range IS medium
    AND likely weather IS mixed
    AND activities ARE sight seeing
    THEN destination IS Prague.

Rule 3 IF price range IS cheap
    AND likely weather IS rain
    AND activities ARE donkey riding
    THEN destination IS Blackpool.

Rule 4 IF price range IS expensive
    AND likely weather IS snow
    AND activities ARE skiing
    THEN destination IS French Alps.

Rule 5 IF price range IS expensive
    AND likely weather IS hot
    AND activities ARE sight seeing
    THEN destination IS Rome.

The above rules are written using forward chaining.

(a) (i) Name the component of an expert system used to hold the facts and rules.  

(ii) Rewrite Rule 1 using backward chaining.

(iii) State the type of chaining most appropriate for this system, giving a reason for your choice.
15. (continued)

(b) When consulting the expert system, a series of questions are asked. The user must answer these questions to allow a recommendation to be made.

(i) Name the component of an expert system that displays the questions and obtains the answers from the user. 1

(ii) By using the rules shown, write down the first question asked during a consultation. 2

(iii) During a consultation, the following recommendation is obtained.

![Destination IS Rome Justification]

List the information provided by the user during the consultation which results in this recommendation. 1

(iv) Identify the type of justification given when the user clicks the justification button. 1

[Turn over
An expert system is used by call desk operators to help trace faults in televisions. Some of the information from the expert system is shown in the following decision tree.

(a) State the category of this expert system.  
(b) One reason for using the system is to trace faults in television sets.  
   Describe two other reasons for using the television fault expert system.  
(c) The first stage of developing the television fault expert system was knowledge acquisition. Describe how knowledge acquisition would have been carried out in this expert system.  
(d) Marcel calls the help desk because his television switches on and gets a picture but he cannot hear anything.  
   (i) Identify the fault the expert system would identify.  
   (ii) Explain the purpose of the inference engine in identifying the fault.
17. SkiPass Holidays provide a range of winter activity holidays. The details about the holidays are held in a database.

Holidaymakers can enter their requirements into the database using a screen like this:

<table>
<thead>
<tr>
<th>Country</th>
<th>France</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resort</td>
<td>Chamonix - Mont Blanc</td>
</tr>
</tbody>
</table>

Please indicate the activity you are interested in

- Downhill Skiing ✓
- Snowboarding
- Snowmobile Safari
- Husky Safari
- Ice climbing
- Cross Country Skiing

Ability

Intermediate

(a) Explain how the results that match these requirements are found in the database when the Holidaymakers click the “Go” button.

(b) SkiPass Holidays decide to replace the database with an expert system. Explain how the output from the expert system would differ from that of the database.

(c) To create the expert system, information in the database must be represented in a suitable form.

The following information about types of ski-runs is to be included in the expert system.

A green run is indicated by a circle signpost. Green runs are designed for absolute beginners because they have a very gentle gradient and feature wide open trails.

A blue run is shown as a square on signage. Blue runs are suitable for novice skiers, as they have fairly shallow slopes and feature wide runs.

A red rectangle is used to notify skiers of intermediate runs, which have a steep gradient and feature narrow runs.

A black diamond is used on the most difficult runs – only advisable for expert skiers because they are very steep and feature moguls.

(i) The first paragraph can be represented using the following attribute-value pair.

Green(sign=circle, gradient=very gentle, difficulty=beginner, feature=wide open trails)

Create an attribute value pair for the last paragraph.

(ii) Name the person responsible for creating this representation during the development of the expert system.
17. (continued)

(d) When the expert system is created, system validation is carried out. Explain how system validation is carried out.

Total for Section III Part B (25)

[END OF SECTION III—PART B—EXPERT SYSTEMS]
SECTION III
PART C—The Internet
Attempt ALL questions in this section.

18. Michelle is an Internet enthusiast. She is interested in finding out about how computers can communicate with each other and carries out some research online.

(a) She reads a webpage about protocols.
   (i) Explain what is meant by the term protocols.  
   (ii) Explain how TCP/IP is used to transmit data across a network.

(b) Michelle finds the following diagram in one of the webpages:

(i) Identify an IP Address from the diagram above.
(ii) Device A is used to connect the computers to form a network. State the name of device A.
(iii) Name an additional piece of hardware that would be required to connect this network to the Internet.

(c) The websites that Michelle visits contain high quality graphics. Picture compression has been used on the graphics.
   (i) Explain why picture compression is required.
   (ii) Describe a development in communications hardware which has made picture compression less necessary.
19. Lucy is the organiser of an annual Art competition. She uses the Internet to help with publicity and communicating with artists. Lucy decides to create her own web pages.

(a) State the most appropriate type of application package for creating her web pages.

(b) Lucy wishes to add some code to her website.
    State the name of the software tool that Lucy would use for this task.

(c) Lucy creates hyperlinks to different web pages within her website.
    She has to decide whether the hyperlinks use absolute page addressing or relative page addressing.
    (i) Describe how absolute page addressing works.
    (ii) Describe one problem associated with absolute page addressing.

(d) Lucy creates a page containing photographs of the winning entries to the Art competition.
    (i) Explain what Lucy should do so that the winning entries can legally be included in the website.
    (ii) Lucy uses a search engine to find some audio to accompany the photographs.
        Identify the most suitable advanced search feature for this search.
20. A family are planning a weekend break and wish to book a hotel room on-line. Their favourite hotel chain is called the Valiant Group which owns hundreds of hotels throughout the UK and abroad. Each hotel has different facilities.

(a) They use an Internet search engine to find a Valiant hotel with a gym, anywhere except London. State the Boolean search that would produce the required results.

(b) Communication takes place between the family and the hotel by e-mail.

(i) State the protocol used for sending e-mail

(ii) State the protocol used for receiving e-mail.
21. CyberTune is a social network site for people who are interested in sharing their own music on the Internet.

(a) Matt Jones is a user of this website. His webpage is shown below in the Voyager Internet browser.

![Voyager Internet Browser](http://www.cybertune.co.uk/matt_jones)

<table>
<thead>
<tr>
<th>Matt Jones</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matt loves classical music and is inspired by the music of 60s hero Zoe Conker. Matt's songs include:</td>
</tr>
</tbody>
</table>

| DOWNLOAD Alpha Guy |
| DOWNLOAD Lovely Girl |
| DOWNLOAD After the day has gone |

E-mail: mattjones@cybertune.co.uk

(i) Identify one navigation feature present in the Voyager Internet Browser.

(ii) State the Internet service which Matt will use to upload new songs to the website.

(b) Matt downloads a song from another musician's web page. Soon afterwards, Matt thinks that he may have a virus. The anti-virus software he has installed on his computer has not given him any warnings.

(i) Describe one of the symptoms of virus infection that may have made Matt think that his computer had a virus.

(ii) Suggest one reason why the anti-virus software may not have detected his computer had a virus.

(iii) State a development in security software which has made downloading music from the Internet safer.

Total for Section III Part C (25)
ACKNOWLEDGEMENTS

Question 9(c) – Helga Esteb/shutterstock.com
Helga Esteb/shutterstock.com
Helga Esteb/shutterstock.com
Helga Esteb/shutterstock.com

Question 11 – Zern Liew/shutterstock.com
Mil Atanasov/shutterstock.com