Attempt all questions in Section I.

Attempt all questions in Section II.

Attempt one sub-section of Section III.

<table>
<thead>
<tr>
<th>Part</th>
<th>Section</th>
<th>Page</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Part A</td>
<td>Applied Multimedia</td>
<td>10</td>
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<tr>
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<td>20 to 23</td>
</tr>
<tr>
<td>Part C</td>
<td>The Internet</td>
<td>16</td>
<td>24 to 28</td>
</tr>
</tbody>
</table>

For the sub-section chosen, attempt all questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.
1. The organisers of a school cross country league store details about all runners and schools in a single table database. Below is a record from this table. “Runner number” is the primary key.

<table>
<thead>
<tr>
<th>Runner number</th>
<th>457</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>Steven Thomson</td>
</tr>
<tr>
<td>Age Group</td>
<td>Under 12</td>
</tr>
<tr>
<td>School</td>
<td>Jackson Academy</td>
</tr>
<tr>
<td>School Address</td>
<td>56 Linton Street, Stonewall</td>
</tr>
</tbody>
</table>

(a) Describe one problem associated with deleting a record from this table.  
2

(b) Suggest a suitable domain for the Age Group attribute.  
2

2. Lyndsay and Jindra attend St Andrew’s Primary School and Kerry attends Hillview Primary School.

(a) Draw an entity occurrence model to illustrate the relationship between primary school and pupil.  
2

(b) State the cardinality of the relationship between primary school and pupil.  
1

3. Define the terms:

(a) referential integrity  
2

(b) entity  
1
4. Supasonic Electronics uses a database to store order details. The data is stored in a table using the primary key and fields as shown below.

<table>
<thead>
<tr>
<th>Customer No</th>
<th>Customer Name</th>
<th>Customer Address</th>
<th>Order Date</th>
<th>Item No</th>
<th>Description</th>
<th>Price (£)</th>
<th>Quantity</th>
</tr>
</thead>
</table>

(a) State the normal form of this data giving two reasons for your answer. 3 marks

(b) Describe how an RDBMS would use a calculated field and a summary field to calculate the total bill for a customer for all items ordered. 2 marks

5. State three different types of organisational information systems. 3 marks

6. State two characteristics which affect the quality of information. 2 marks

7. A group of 5th year pupils has created the latest edition of the school magazine.

(a) Describe how pagination could help in the layout of the magazine. 2 marks

(b) State two features of text formatting that can be controlled by a style sheet. 2 marks

8. Describe one economic implication of ICT for a business. 2 marks

9. Describe what is meant by a denial of service attack. 2 marks

10. In terms of a back-up strategy, describe what is meant by an archive. 2 marks

(30 marks)

[END OF SECTION I]
SECTION II

Attempt ALL questions in this section.

11. Customers at Sunshine Holidays are sent a summary of their holidays. Samples of summaries for the Atlanta hotel are shown below.

<table>
<thead>
<tr>
<th>Customer No</th>
<th>Name</th>
<th>Address</th>
<th>Telephone</th>
<th>Holiday ID</th>
<th>Departure Date</th>
<th>Duration</th>
<th>Cost</th>
<th>Hotel</th>
<th>Hotel Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1263</td>
<td>Joy McGregor</td>
<td>23 High Street, Strathdon</td>
<td>01542 377642</td>
<td>FD17K</td>
<td>08/07/2015</td>
<td>7 nights</td>
<td>£1758</td>
<td>Atlanta</td>
<td>****</td>
</tr>
<tr>
<td>1654</td>
<td>Douglas Buchan</td>
<td>65 Market Street, Balloch</td>
<td>01976 646727</td>
<td>FD675K</td>
<td>08/07/2015</td>
<td>7 nights</td>
<td>£2995</td>
<td>Atlanta</td>
<td>****</td>
</tr>
<tr>
<td>7645</td>
<td>Tom Ferguson</td>
<td>78 Johnstone Avenue, Elderslie</td>
<td>01776 476634</td>
<td>FD675L</td>
<td>09/10/2015</td>
<td>14 nights</td>
<td>£3088</td>
<td>Atlanta</td>
<td>****</td>
</tr>
</tbody>
</table>
SECTION II (continued)

11. (continued)

This data can be represented in un-normalised form as:

- Customer No
- Name
- Address
- Telephone
- Holiday ID
- Departure Date
- Duration
- Cost
- Hotel
- Hotel Rating

Using Customer No as the primary key, transform this un-normalised data to third normal form.

You must show the intermediate stages of first normal form and second normal form and identify all primary and foreign keys at each stage of normalisation.

12. Inverdon Electrical is a small company supplying electrical goods to a few shops in the local area. The structure of the data model they intend to use is shown below.

<table>
<thead>
<tr>
<th>Customer</th>
<th>Order</th>
<th>Supplier</th>
<th>Item</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer number</td>
<td>Item number*</td>
<td>Supplier name</td>
<td>Item number</td>
</tr>
<tr>
<td>Customer name</td>
<td>Order date</td>
<td>Supplier address</td>
<td>Item name</td>
</tr>
<tr>
<td>Customer address</td>
<td>Customer number*</td>
<td>Supplier telephone</td>
<td>Price</td>
</tr>
<tr>
<td>Customer telephone</td>
<td>Number ordered</td>
<td>Photo</td>
<td>Supplier name*</td>
</tr>
</tbody>
</table>

(a) Draw an entity relationship diagram to represent this data model.

(b) (i) The following data dictionary represents the Item entity. It has a number of missing entries which are highlighted as A, B, C, D and E. State a suitable entry for each of the missing values.

<table>
<thead>
<tr>
<th>Attribute</th>
<th>Data Type</th>
<th>Validation</th>
<th>Unique</th>
<th>Index</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item number</td>
<td>A</td>
<td>&gt;=1000 and &lt;=9999</td>
<td>Y</td>
<td>Y</td>
<td>PK</td>
</tr>
<tr>
<td>Item name</td>
<td>Text</td>
<td></td>
<td>N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Price</td>
<td>B</td>
<td>&gt;0.50 and &lt;1000.00</td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Photo</td>
<td>C</td>
<td></td>
<td>N</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Supplier name</td>
<td>Text</td>
<td></td>
<td>D</td>
<td>E</td>
<td>Y FK</td>
</tr>
</tbody>
</table>

(ii) State one advantage OR one disadvantage of indexing an attribute.
13. Northbank Council is planning to replace the majority of computer hardware and software in a local secondary school over a two week period in March.

(a) (i) Copy and complete the following table to show what the Council should consider before starting this replacement programme.

<table>
<thead>
<tr>
<th>Area</th>
<th>Points to Consider</th>
</tr>
</thead>
<tbody>
<tr>
<td>Future Proofing</td>
<td></td>
</tr>
<tr>
<td>Compatibility</td>
<td></td>
</tr>
<tr>
<td>Legacy Systems</td>
<td></td>
</tr>
</tbody>
</table>

(ii) The Council should have a strategy to manage these three areas. State this type of strategy.

(b) Other than cost, state five criteria that the Council should use to help choose the most appropriate software for the school.

(c) The Council uses a client/server LAN where each computer has a network adapter.

Define the following terms:

(i) client/server;

(ii) LAN;

(iii) network adapter.
14. Morag plays the online game Zombeez. Her social media persona is “Buttercup” but when she plays Zombeez she prefers to use the persona “Axeman”.

The screen below shows the webpage with the highest scores.

<table>
<thead>
<tr>
<th>Name</th>
<th>Highest Score</th>
<th>Titles Earned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ripper</td>
<td>35454</td>
<td>Skull Cracker</td>
</tr>
<tr>
<td>Slayer</td>
<td>34300</td>
<td>Skull Cracker</td>
</tr>
<tr>
<td>Axeman</td>
<td>32988</td>
<td>Sorcerer</td>
</tr>
<tr>
<td>Xena</td>
<td>32566</td>
<td>Skull Cracker</td>
</tr>
</tbody>
</table>

(a) Suggest one reason why Morag has decided to use the persona “Axeman”.

(b) Information can be categorised in terms of its use. For example, the information on the above webpage is for control and is useful to Morag to see the scores she needs to beat.

Other than use and nature, categorise the information on the above webpage under four additional headings by copying and completing the following table.

<table>
<thead>
<tr>
<th>Heading</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Use</td>
<td>Control</td>
</tr>
<tr>
<td>Nature</td>
<td>Formal and Quantitative</td>
</tr>
</tbody>
</table>

(c) Changing the font to Chiller could enhance the highest scores webpage for Zombeez gamers.

Describe three features of web authoring software that could be used to enhance this page.
15. The diagram below shows the critical path for a construction project.

<table>
<thead>
<tr>
<th>Project A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task 1</td>
</tr>
<tr>
<td>Task 2</td>
</tr>
<tr>
<td>Task 3</td>
</tr>
<tr>
<td>Task 4</td>
</tr>
</tbody>
</table>

Task 1, Task 3 and Task 4 form the critical path.

(a) Describe what is meant by *critical path analysis*.  

(b) (i) State the type of software used to carry out critical path analysis.  

(ii) Other than critical path analysis, state **two** further features of this type of software.
SECTION III

Attempt ONE sub-section of Section III

Part A  Applied Multimedia  Page 10  Questions 16 to 19
Part B  Expert Systems  Page 14  Questions 20 to 23
Part C  The Internet  Page 16  Questions 24 to 28

For the sub-section chosen, attempt all questions.
16. An extract from an e-mail from the head coach at Bankhaven swimming club to a multimedia development team is shown below.

. . . to develop a DVD ROM to support newly qualified coaches at Bankhaven swimming club by providing sample lesson plans and instructional video clips.

The development team use the information to help produce a requirements specification.

(a) State three items found in a requirements specification and give an example of each from the e-mail extract.

(b) List the personnel responsible within the development team for each of the tasks 1 to 5 below.

<table>
<thead>
<tr>
<th>Task</th>
<th>Personnel Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inserts video clips of swimmers into product</td>
<td></td>
</tr>
<tr>
<td>2. Checks lesson plans are correct</td>
<td></td>
</tr>
<tr>
<td>3. Agrees the completion date</td>
<td></td>
</tr>
<tr>
<td>4. Decides on a colour scheme</td>
<td></td>
</tr>
<tr>
<td>5. Edits the video clips</td>
<td></td>
</tr>
</tbody>
</table>
SECTION III

Part A—Applied Multimedia (continued)

16. (continued)

The screen below includes an instructional video for the breaststroke from the completed DVD ROM.

(c) A metaphor has been used in the design of this screen.

(i) Explain what is meant by a metaphor.

(ii) Identify the metaphor used in this case.

(d) Name and describe the three methods that have been used in the sample screen to aid navigation in hyperspace.
17. Total Action Games are having their website updated. Part of the requirements specification is shown below.

... users will be able to create an account and then choose from four different types of online games, Arcade, Role Play, Tower Defence and Puzzles. Background music should continue to play as the user moves from page to page.

The developer’s navigational map for the updated website is shown below.

(a) State the type of navigation structure shown above.

(b) On Screen A, a user enters their e-mail address and then creates their username and password. Passwords have to be entered twice.

A button has to be created to allow the user to return to the previous page and another button created to submit their details and continue.

The company logo appears at the top of the screen. The pathname to the logo is:

C:\Total_Action\website\images\logo.png

(i) Pathnames can be absolute or relative. State the type of pathname shown above.

(ii) Draw an outline storyboard for Screen A.

(iii) State the most suitable type of user interface for Screen A.

(iv) Explain why users are asked to enter a password twice on this screen and identify whether this process of double entry relates to data security, data integrity or data privacy.
17. (continued)

(c) The website has been created and is ready for testing. When Screen B is opened, the screen below is displayed but no background music plays.

Screen B could fail all four types of testing for four different reasons.

(i) With reference to the requirements specification on the facing page, copy and complete the following table suggesting one reason for failure of this screen in each type of testing.

<table>
<thead>
<tr>
<th>Type of Testing</th>
<th>Reason for Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen Testing</td>
<td></td>
</tr>
<tr>
<td>Integration Testing</td>
<td></td>
</tr>
<tr>
<td>Acceptance Testing</td>
<td></td>
</tr>
<tr>
<td>Usability Testing</td>
<td></td>
</tr>
</tbody>
</table>

(ii) Evaluate Screen B in terms of accessibility.

18. Kerning and anti-aliasing can be used to enhance the appearance of media elements. Describe kerning OR anti-aliasing. You may use a diagram to illustrate your answer.

19. TIFF, JPEG, GIF, MP3, MIDI and MPEG are all standard file types. Choose four of these file types and for each give a description of its features and use.
SECTION III

Part B—Expert Systems

Attempt all questions.

20. Throughout history there have been several pandemics. Pandemics are widespread and uncontrolled diseases that significantly reduce world population. Bubonic Plague, Cholera and Spanish Flu are diseases which still exist and can lead to pandemics.

(a) Describe one benefit and one drawback that would particularly apply to an expert system on diseases.

Here are some notes from records kept during outbreaks of each disease.

“. . . the shopkeeper had swollen glands a week ago. He died this morning. Doctor Johnston tells us he had Bubonic Plague and that fleas carry this disease . . .”

“. . . the water supply in the city is contaminated. Cholera is spreading throughout the population. There have been many cases of diarrhoea. Some citizens are dying within hours of feeling unwell . . .”

“. . . I have the fever. We should not have let the sailors land. Islanders are dying within hours. It is an outbreak of Spanish Flu . . .”

(b) (i) Derive three attribute pairs for cholera.

(ii) Create a factor table for these three diseases.

(iii) Create three rules, one for each type of disease.

(iv) Rewrite one of your rules in part (iii) using a different method of chaining. State this method of chaining.

(v) Derive a question that would be part of a user consultation in an expert system based on the notes above.

(c) The process of developing an expert system on diseases involves three stages. State a suitable entry for each of the missing values labelled A to E.

<table>
<thead>
<tr>
<th>Stage of Development</th>
<th>Personnel</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Researcher</td>
<td>Contacting experts, searching references</td>
</tr>
<tr>
<td>Knowledge representation</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>E</td>
<td>Testing</td>
</tr>
</tbody>
</table>

(d) State the names of two classical expert systems with a medical domain.
21. Some expert systems make use of certainty factors. Describe what certainty factors are and how they are used in an expert system.

22. To play the online game, BeetleBlast, Gwen has to create an account and give her e-mail address.

(a) Explain why gamers are asked to enter an e-mail address twice when creating an account and identify whether this process of double entry relates to data security, data integrity or data privacy.

Gwen has developed the following strategy for playing BeetleBlast.

“When Gwen sees an ant and her character is not hungry then Gwen will blast it.”

(b) Represent this strategy in predicate logic.

(c) Represent this strategy in propositional logic.

One of the rules of the game is shown below.

“Gamers who capture a dung ball and are not injured achieve the rank of bombardier beetle.”

(d) Represent this rule using the more suitable logic (predicate or propositional).

23. (a) Explain what is meant by a deductive database.

(b) Compare a relational database with an expert system in terms of the method of extracting information.
24. The King’s Hotel is opening a new conference centre and is adding information about it to its website. All the photographs of the conference rooms have still to be uploaded to the web server. The current HTML code for the web page is shown below.

```html
<html>
<head>
</head>
<body>
<div style="text-align: center;">
<h1>King’s Hotel</h1>
<br>
<h3>Conference Facilities</h3>
<br>
<img style="width: 300px; height: 100px;" alt="Conference" src="Strathbrae.jpg">
</div>
</body>
</html>
```

(a) Sketch the output that would be produced by this code.

(b) Create the HTML code required to display “King’s Hotel” as shown in the diagram below and describe where in the existing code it should be placed.

(c) The e-mail address for the hotel is info@King’sHotel.biz.co.uk. Create the HTML code to add a link for this e-mail address to the webpage.
SECTION III

Part C—The Internet (continued)

24. (continued)

(d) The developer has added the following table to the webpage.

<table>
<thead>
<tr>
<th>Strathbrae Room</th>
<th>£250 per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braemar Room</td>
<td>£175 per day</td>
</tr>
</tbody>
</table>

State suitable entries for each of the missing values A, B, C and D to complete the code for the table.

```html
<table>
  <tbody>
    <tr>
      <td style="D: 184px;">Strathbrae Room</td>
      <td style="D: 112px;">£250 per day</td>
    </tr>
    <tr>
      <td style="D: 184px;">Braemar Room</td>
      <td style="D: 112px;">£175 per day</td>
    </tr>
  </tbody>
</table>
```

(e) (i) The conference room photograph has now been uploaded and can be found using the URL:

http://www.kingshotel.biz/conference/images/Strathbrae.jpg

Identify and name two parts of the structure of this URL.

(ii) State the protocol which translates a URL into an IP address.
25. Total Action Games are updating their website. A screenshot of one of the pages the developer has produced is shown below.

(a) Using the webpage above, copy and complete the last 3 rows of the following table to evaluate the design of this page of the website.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uniformity of presentation</td>
<td>Good as fonts, sizes and styles are consistent with other web pages</td>
</tr>
<tr>
<td>Page structure and layout</td>
<td></td>
</tr>
<tr>
<td>Download efficiency</td>
<td></td>
</tr>
<tr>
<td>Browser compatibility</td>
<td></td>
</tr>
</tbody>
</table>

(b) The developer has used *cascading style sheets* to implement uniformity of presentation of the website.

(i) State what is meant by cascading style sheets.  

(ii) The username “*AXEMAN*” could be formatted using an internal or external style sheet. State which type of style sheet would be more appropriate in this case. Justify your answer.

(iii) State whether or not this webpage is dynamic. Justify your answer.
SECTION III

Part C—The Internet (continued)

26. There are several organisations responsible for various aspects of the Internet. State the organisations labelled A to D.

<table>
<thead>
<tr>
<th>Task</th>
<th>Organisation Responsible</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Dealing with Internet standards eg latest version of IP</td>
<td>A</td>
</tr>
<tr>
<td>2. Allocating domain names in the UK</td>
<td>B</td>
</tr>
<tr>
<td>3. Dealing with standards in HTML and XML</td>
<td>C</td>
</tr>
<tr>
<td>4. Allocating IP addresses</td>
<td>D</td>
</tr>
</tbody>
</table>

27. Describe how packet switching, routers and routing tables are involved in the transfer of data across the Internet.

28. After making an online booking with Sunshine Holidays, Joy McGregor chooses to receive her booking confirmation by e-mail.

Sunshine Holidays
Thank you for your recent enquiry
Details of your holiday will be sent to

Enter e-mail address: ____________________________
Re-enter e-mail address: ____________________________

Credit card payments are secure with us!

(a) Explain why customers are asked to enter an e-mail address twice on this screen and identify whether this process of double entry relates to data security, data integrity or data privacy.

(b) Describe how Sunshine Holidays could ensure that the customer credit card details are transmitted securely.

(c) Describe how site usage tracking would help Sunshine Holidays increase sales.

(d) Describe how client-side scripting could be used on this web page.

(50)

[END OF SECTION III—PART C]

[END OF QUESTION PAPER]
ACKNOWLEDGEMENT

Question 16 – Gert Vrey/shutterstock.com