X216/701

NATIONAL QUALIFICATIONS 2009

FRIDAY, 29 MAY
1.00 PM – 3.30 PM

INFORMATION SYSTEMS
ADVANCED HIGHER

Attempt **all** questions in Section I.

Attempt **one** sub-section of Section II.

Part A	Information Systems Interfaces	Page 10	Questions 6 to 9
Part B	On-line Database Systems	Page 16	Questions 10 to 14

For the sub-section chosen, attempt **all** questions.

Read all questions carefully.

Do not write on the question paper.

Write as neatly as possible.

Each section should be answered in a separate answer book.

SECTION I

Answer ALL questions in this section.

Marks

1. Clydesdale High School has appointed a team of developers to create a new management information system. The new system will be used by the school office staff, guidance staff and class teachers to monitor pupil attendance and pupil progress.

The developers carry out a feasibility study before investigating the paper-based systems currently used at the school.

(*a*) What aspects of a development would be considered as part of the *legal* and *time* feasibility? **2**

(*b*) Describe the importance of the following results of the investigation:

(i) *departmental objectives;* **1**

(ii) *organisational procedures*. **1**

(*c*) Describe **one** difference between *logical design* and *physical design*. **2**

(*d*) The developers use a *graphical design notation* to describe the processess in the new system.

Name **one** graphical design notation with which you are familiar and explain how this technique is used to describe processes within an information system. **2**

(*e*) The developers use relational database management software to implement the new system. The software provides the developers with a number of components that can be used to build the system.

Name the component that would be used to build:

(i) a user-friendly way of interacting with the system; **1**

(ii) an automated mechanism used daily to update pupil absence totals. **1**

(*f*) A test plan is used in the *systematic testing* of the new system.

(i) Explain the need for systematic testing of an information system. **2**

(ii) A test plan identifies the elements to be tested.

Name **two** additional components of any test plan. **2**

(iii) Describe how *acceptance testing* of an information system would be carried out.

Your answer should indicate the personnel involved and their role during the testing. **2**

Marks

1. (continued)

(*g*) Once a new system has been fully implemented, the developers evaluate the *maintainability* of the system.

Describe **two** features of a system's implementation that would be considered when evaluating its maintainability. **2**

(*h*) In future, there may be a need for maintenance of the management information system.

Explain how maintenance activities rely on the *iterative nature* of the systems analysis and design life cycle. **2**

[Turn over

2. WarmGlo Tours is a travel company specialising in one-week package holidays to Spain. Each WarmGlo client is allocated a WarmGlo representative (rep) for their week's stay. Shortly after arrival in the resort, all clients attend an introductory meeting with their rep. At this meeting, clients are given an Excursion Details Card. This provides information about the excursions available. An example of a completed Excursion Details Card is shown below.

Excursion Details Card

Excursion number	Excursion Name	Excursion Cost	Excursion Day	Excursion Leaves	Excursion Returns
1	Tour of Old Town	£15·00	Monday	08.30	12.30
			Thursday	14.00	18.00
2	HydroPark	£20·00	Monday	08.00	11.00
			Wednesday	14.00	17.00
3	Bullfight	£18·50	Saturday	14.00	16.30

Before leaving the introductory meeting, clients are asked to provide the rep with details of any excursions they wish to take. Later, the rep adds details of selected excursions to individual Client Record Cards. An example of a completed Client Record Card is shown below.

Client Record Card

Arrival Date	7/6/2009	*Hotel Name*	Buena Suerte
Client First Name	Margaret	*Hotel Address*	3 Via Cortez
Client Last Name	Ellis	*Hotel Phone Number*	0202 45673 237
Client Date of Birth	22/02/1982	*Rep ID*	842
Client Age	27	*Rep First Name*	Iain
Client Passport Number	800526843	*Rep Last name*	Macdonald
		Rep Phone Number	0202 57284

Excursions Chosen

Excursion Number	Excursion Name	Excursion Day	Excursion Cost
2	HydroPark	Monday	£20·00
2	HydroPark	Wednesday	£20·00
3	Bullfight	Saturday	£18·50
		Total Cost	£58·50

Marks

2. (continued)

Normalise the data provided in the source documents opposite. You should show all stages of the process from UNF through to 3NF. The following points should be noted when creating your solution.

- All WarmGlo holidays last for one week
- Clients can book several holidays, each with a different arrival date
- A client is allocated to only one representative per holiday
- Client Age and Total Cost are calculated values
- No two hotels have the same name

You must not introduce any new attributes in your solution. **15**

[Turn over

Marks

3. SainCo is a large superstore. Each item for sale has a core set of attributes which are held in the item table of the stock database:

item (itemID
itemname
price
number in stock)

SainCo sells a wide variety of goods including grocery, electrical and media items. Each type of item for sale has a set of non-core attributes that are also stored in the stock database:

grocery (itemID
item weight
brand)

electrical (itemID
item description
brand)

media (itemID
media type
title
publisher)

When items need to be restocked, an order is placed with the relevant supplier. The order and supplier entities are stored in the store's stock database:

order (orderNo
supplierID
orderdate)

supplier (supplierID
suppliername)

The details of the items ordered are stored in the order_detail entity:

order_detail (orderNo
itemID
quantity)

New items are added to the system the first time that they are ordered (with a stock level of zero until the order arrives). Each order has exactly one supplier, although a supplier may supply a number of orders to the store. Some suppliers have yet to be used by the superstore.

(*a*) Create an *entity relationship diagram* for these entities. Your diagram should show the entities, relationships and the cardinality of the relationships. **4**

(*b*) Indicate, by adding to your entity relationship diagram:

(i) whether the entities are strong or weak; **1**

(ii) whether the relationships are strong or weak; **2**

(iii) whether the relationships are mandatory or optional. **3**

Marks

4. CleverCooks is a company that provides catering for private events. An information system is used to store CUSTOMER, CONTACT, BOOKING, ITEM and MENU details. Read the following description of events that affect the CleverCooks information system.

New customers must register with the company by providing personal details (including name, address and telephone number). These details are stored in the CUSTOMER entity. The details of existing customers already stored in the CUSTOMER entity are checked to ensure that they are still correct and any necessary updates are made.

Bookings can be made in two ways: when bookings are made via the company website, customers must provide their email address; when a booking is made by telephone, there is no need to store an email address. The company stores all email addresses in its CONTACT entity. Details of each booking are stored in the BOOKING entity. The booking details include a unique booking reference, the customer reference, venue details (place, address and postcode), event details (date, time and number of guests) and booking status (the status of all new bookings is set to "provisional"). The creation of a booking automatically creates a new entry for each menu item selected. This information is stored in the ITEM entity and includes the booking reference, the menu code and the number of servings required (the menu code matches the menu code in the MENU entity. The MENU entity also stores details of the cost per serving).

Once a provisional booking has been made, the value of the deposit (50% of the total expected cost) is calculated and details of the deposit required are posted or emailed to the customer. Customers must confirm a provisional booking by paying the full deposit within one month—all bookings that remain unconfirmed after one month are automatically deleted along with any associated booking items. Once the full deposit has been paid, the booking status is set to "confirmed".

Customers can adjust the number of guests and number of servings of each menu item selected up to one week before the event. In certain circumstances, customers may need to cancel a booking. The details of all cancelled bookings and associated booking items are then archived.

Create an *entity event matrix* for the CleverCooks information system based on the description provided above. **6**

[Turn over

Marks

5. HappyHomes is an Estate Agency. Several processes carried out within the agency are described below.

SELLER REGISTRATION

Sellers register with the agency and provide information about the house that is for sale. Details of the house are stored in the listings file and personal information about the seller is added to the seller file.

BUYER REGISTRATION

When buyers register with an agency, they provide details of their requirements by completing a requirements form—these details are later transferred to the requirements file and buyer contact details are transferred to the buyer file.

BUYER NOTIFICATION

Monthly, the agency produces a leaflet containing details of all houses for sale. This leaflet is sent to all registered buyers. From time to time, the agency finds a house that matches a buyer's requirements and sends details of the match to the buyer.

OFFER PROCESSING

If a buyer wants to buy a particular house, details of the offer must be provided to the agency who forward the offer details to the relevant seller. After considering the offer, the seller can decide to accept or reject the offer and notifies the agency. Once an offer has been accepted, the agency asks one of the surveyors listed in the surveyors file to make a valuation of the house. Once the house has been surveyed, the surveyor notifies the agency of the house valuation.

Create a *level 1 data flow diagram* to represent the processes described above. **9**

(60)

[*END OF SECTION I*]

SECTION II

Attempt ONE sub-section of Section II

Part A	**Information Systems Interfaces**	**Page 10**	**Questions 6 to 9**
Part B	**On-line Database Systems**	**Page 16**	**Questions 10 to 14**

For the sub-section chosen, attempt *all* questions.

[Turn over

SECTION II

Part A—Information Systems Interfaces

Answer ALL of the questions in this part.

Marks

6. You have been asked to design the interface for an interactive website for young children.

(*a*) As a website designer, you will need to consider *Web accessibility guidelines*.

Show how Web accessibility guidelines will affect the design of the site by describing **one** example of good practice and **one** example of bad practice. You must provide **two** different examples to gain full marks for the question. **2**

(*b*) The target audience of the website can be classed as *novice* users. Describe the characteristics and needs of novice users. **2**

(*c*) In order to navigate to a particular section of the site, users can either click on the appropriate hyperlink or hover over the relevant icon. Using this example to support your answer, describe the operation of the website interface in terms of its *syntax* and *semantics*. **2**

(*d*) Usability testing of the website is to be carried out.

Explain how the *quantitative techniques*:

(i) *time to learn,* and **2**

(ii) *user retention of commands over time* **2**

would be used to develop a usable interface for the website.

(*e*) Explain why the use of *surveys* rather than *questionnaires* would be a more appropriate *inquiry method* to use to evaluate the website. **2**

7. The iMP3 is a hand-held media player and mobile phone that incorporates many features of an intelligent user interface. The main method of input is a touch-sensitive screen controlled by the user's fingers. When a user wants to enter text, a small on-screen keyboard is displayed and letters must be selected one at a time. The software anticipates the letter most likely to be selected next and temporarily enlarges the "hit" area to avoid errors caused by fingers not hitting the exact spot.

(*a*) Describe the **two** types of intelligent behaviour demonstrated by the iMP3 interface. Your answer should refer to specific features described above. **2**

(*b*) The iMP3 device allows video and TV to be viewed. Describe **two** *technological factors* which have made this feature of portable devices possible. **2**

(*c*) In designing the user interface for the iMP3, the developers made use of both *low-fidelity* and *high-fidelity prototypes*.

(i) Describe **one** example of a low-fidelity prototype and explain how it might be used. **2**

(ii) Explain how *RAD tools* assist in the development of high-fidelity prototypes. **2**

(*d*) The developers used a number of *qualitative techniques* to evaluate the user interface of the iMP3.

(i) Which qualitative technique would **not** be suitable in this situation? **1**

(ii) Explain why this is the case. **1**

(*e*) The *user guide* and *system design documentation* are produced during the development of any new product.

Explain the purpose of **both** types of documentation. **2**

[Turn over

8. HighStreet is a chain of department stores with branches throughout Scotland. Regular customers of the chain can opt to join a loyalty card scheme and earn loyalty points with each purchase. In each store, information kiosks are being introduced. The information kiosks will be used by customers with loyalty cards to carry out a number of tasks. The use of these information kiosks is described below.

When unused, each kiosk displays a PROMPT screen, prompting customers to enter their loyalty card. The kiosks remain in this "waiting" state until a customer finally enters a loyalty card. Once a loyalty card has been entered, the kiosk displays the WELCOME screen.

At the WELCOME screen, each customer is presented with 4 options: customers can check their POINTS BALANCE, update their CONTACT DETAILS or check for SPECIAL OFFERS. Customers can also opt to END their current session. Whenever this option is selected, the kiosk returns to the "waiting" state, displays the PROMPT screen and ejects the customer's loyalty card.

At the POINTS BALANCE screen, the customer's current points balance is displayed along with the date and time. Below this information, 3 options are presented: PRINT which produces a small receipt-sized hardcopy of the current points balance, RETURN which allows customers to return to the WELCOME screen or END which ends the current session.

At the CONTACT DETAILS screen, customers can CONFIRM that they want to update their contact details, select the RETURN option or select the END option. By selecting CONFIRM, a new ENTER DETAILS screen is presented. On this screen, the customer's recorded name and address are displayed. Below each detail is a blank space that can be used by the customer to key-in the updated name and/or address. The RESET NAME and RESET ADDRESS options can be used to clear the details entered by the customer—both RESET buttons refresh all other details displayed on the ENTER DETAILS screen. Having updated the necessary detail(s), the customer can then select the CANCEL or UPDATE options. By selecting the CANCEL option, customers are returned to the WELCOME screen; by selecting the UPDATE option, the message "Your contact details have been updated" is displayed in a new UPDATED screen. Customers can then opt to RETURN to the WELCOME screen or END the current session.

At the SPECIAL OFFERS screen, the daily special offers are listed. Beside the description of each offer is an option to PRINT a money-off voucher. Having viewed details of the special offers, customers can choose to PRINT one or more of the money-off vouchers, RETURN to the WELCOME screen or END their current session.

8. (continued)

(*a*) Describe the interface of the information kiosks in terms of:

- mode;
- methods of input/output. **2**

(*b*) At what stage of the *LUCID methodology* would the design for the main WELCOME screen be planned? Explain your answer. **2**

(*c*) Create a *state transition diagram* to represent the operation of the kiosks as described opposite. Your state transition diagram should indicate the transitions between screens and the events that trigger each transition. **10**

(*d*) Describe the use made of a *heuristic evaluation* and a *walkthrough* to inspect an information kiosk. **4**

[Turn over

SECTION II

Part A—Information Systems Interfaces (continued)

Marks

9. GPS Ltd is a mapping company which provides personal navigation systems. The company has developed a device called a Ta-Ta which connects to a geographical information system and downloads and displays real-time maps and travel information for the user. The device has a touch sensitive screen and is small enough to be hand-held or mounted on the dashboard of a car. The user interface of the Ta-Ta is shown below.

(*a*) The Ta-Ta device incorporates a *command and control system*.

Explain why a command and control system is appropriate in this situation. **2**

(*b*) Explain the importance of *subjective user satisfaction* to GPS Ltd as developers of the Ta-Ta interface. Your answer should identify **two** relevant user opinions and explain their importance to GPS Ltd. **2**

(*c*) GPS Ltd has developed an upgrade to the current software which integrates mobile phone communications into the Ta-Ta device. The upgrade provides up-to-date traffic and weather information throughout the journey for any route entered into the system.

(i) What type of *maintenance* was required to add this new feature to the Ta-Ta? **1**

(ii) Before the upgrade is made available to customers, *usability testing* must be carried out.

Is the *question-asking protocol* a suitable technique for giving feedback to the developers? Justify your answer by referring to the Ta-Ta device and its testing. **2**

9. (continued)

(*d*) The Ta-Ta device stores details of places of interest in a "Place of Interest" entity. The exact location of each place of interest is uniquely defined by its latitude and longitude (latitude is a value between - 90 and + 90; longitude is a value between - 180 and + 180). A sample record for the entity is shown below:

Category:	Restaurant
Name:	The Golden Spanner
Latitude:	55.895014
Longitude:	-3.076453
Last updated:	24/5/2009

Create a *data dictionary* for the "Place of Interest" entity. You should indicate the data type, size, validation and indexing required for each attribute in the entity. **4**

(*e*) A review for each place of interest is stored in a "Review" entity. Reviews can be created by Ta-Ta owners or by commissioned writers. Once created, a review can receive ratings and/or be edited by a review editing team. A review is removed from the entity when it is more than five years old or when a place of interest is deleted from the system.

Construct an *entity life history diagram* to illustrate the life span of the "Review" entity. **6**

(*f*) Describe **one** use that could be made of *user performance data logging* to evaluate the usability of the Ta-Ta device. **1**

[*END OF SECTION II—PART A*]

[Turn over

SECTION II

Part B—On-line Database Systems

Answer ALL of the questions in this part.

Marks

10. Cardwell High School is developing a new school website. The website will provide up-to-date information for parents, pupils and the wider community. A small group of website publishers has been formed to oversee the website development. The publishers have decided that the home page will include a short introduction written by the Head Teacher and provide links to a number of other pages including:

- whole school information
- curricular information
- sports club activities
- school events.

The curricular information will be provided by each subject department and should include links to external sites that provide interactive activities. For this to happen, each department will have a designated departmental author who will be trained to create the departmental web pages. Once pages have been created they will then be submitted to the publishers for approval. The publishers have the authority to proofread all pages created, approve content and publish the website pages on the Internet.

The school has decided to use a *content management system* to develop the school website.

(*a*) Describe the purpose and typical users of a content management system. **2**

(*b*) Describe **three** benefits of using a content management system to develop the school website described above. **3**

SECTION II

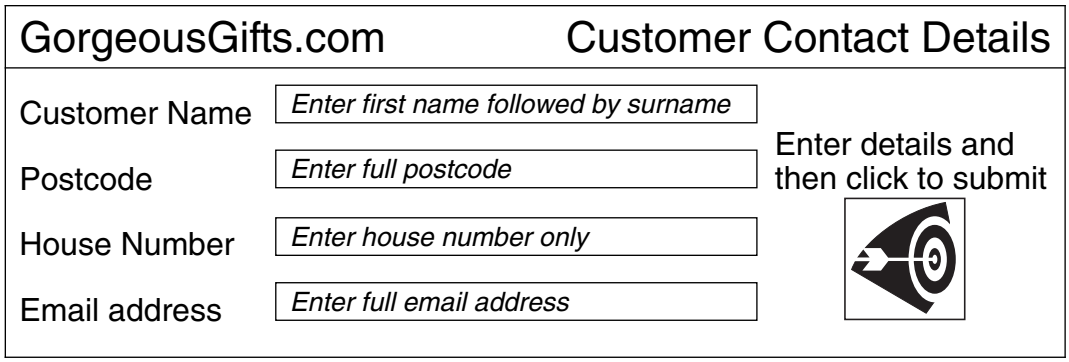
Part B—On-line Database Systems (continued)

Marks

11. www.GorgeousGifts.com is an on-line website that sells specialist gifts to the general public. Visitors to the GorgeousGifts website can view the on-line catalogue, select items and make purchases on-line. The company maintains a large list of customer details—both past and present.

(*a*) Describe **one** use made of *customer relationship management* by GorgeousGifts. **1**

(*b*) Whenever new customers purchase items from the GorgeousGifts site, they are first asked to provide their contact details. The HTML form used for this purpose is shown below:



(i) Describe the use made of the <*form*> *element* in creating the structure of this HTML form. Your answer should refer to the *action* and *method* attributes of the form element. **2**

(ii) The <*input*> *element* and its attributes *type, name* and *value* are used to enter the customer details in the HTML form.

Write the HTML to show how the <input> element would be used to enter the customer name as shown in the form above. **3**

(iii) The button shown in the form above contains the <image> element as follows:

```
<img src= "imagesubmit.gif" />
```

Write HTML code to show how the <*button*> *element*, with its attributes *type* and *name*, would be used to submit the contact details entered by the customer. **2**

(*c*) GorgeousGifts obtain their gift items from a number of suppliers, some of whom are based overseas. All orders and payments are transmitted by making use of *electronic data interchange* (*EDI*).

(i) Explain the importance of *transaction standardisation* in this situation. **2**

(ii) Explain why the development of value-added networks (VANs) has enabled small companies to benefit from EDI. **2**

12. *Server-based database management tools* allow direct manipulation of database tables held on database servers.

The database table called comicbook is part of an on-line database system held on a database server. The values stored in Record 1 of the comicbook table are shown below:

comicbook Record 1

Values Stored

comicID	Author	Artist	Title	Price
9	John Byrne	Richard Giordano	Man of Steel	13·69

(*a*) The comicID field was initially set up as a numeric field. The field-type is to be changed to a text field of size 5.

Using a server-based database management tool with which you are familiar, describe how this change would be made. **2**

(*b*) The values currently stored in Record 2 of the comicbook table are to be updated as indicated below.

comicbook Record 2

Current Values

comicID	Author	Artist	Title	Price
12	Stan Lee	Jack Kirby	The Amazing Spider-man	15·89

Updated Values

comicID	Author	Artist	Title	Price
12	Stan Lee	Steve Ditko	The Amazing Spider-man	12·99

Describe how a server-based database management tool would be used to update the contents of Record 2 of the comicbook table as required. You should assume that unchanged values do not need to be re-written to the record. **5**

(*c*) *Rapid application development* (*RAD*) *tools* are often used in the development of on-line database systems.

Explain how RAD tools can reduce the time required to develop an on-line database system. **2**

(*d*) The *user guide* and *system design documentation* are produced during the development of any new product.

Explain the purpose of **both** types of documentation. **2**

[Turn over for Question 13 on *Page twenty*

13. A professional photographer uses a database server to store details of all photographs he takes on various photo assignments. He displays the photographs on a website so that the visitors to the site can browse the photo gallery and select photos that they wish to purchase.

The database server stores details of the photo assignments and photographs in two separate tables. The structure of both tables is shown below.

Table: Assignment

Assignment ID	Date	Location	Last Name	First Name
1	01/02/2008	Glasgow	Rahim	Pranav
2	01/02/2008	Edinburgh	Kane	Oliver
3	03/02/2008	Glasgow	Bruce	Andrew
4	04/02/2008	Dumfries	Livingstone	Gavin

Table: Photograph

Assignment ID	Photograph Number	Title	Price
1	101	Wishing Well	£1·50
2	101	Cal Craig	£7·50
1	102	The Cat	£2·99
1	103	My House	£3·50

(*a*) The data row "1, 103, My House, £3·50" has to be removed from the "Photograph" table.

(i) Would *data manipulation language* (*DML*) or *data query language* (DQL) be used to remove this data? Justify your answer. **2**

(ii) Write the SQL statement that would remove "1, 103, My House, £3.50" from the "Photograph" table. **2**

(*b*) A query is used to produce the result shown in the table below.

Assignment ID	Location	Photograph Number
2	Edinburgh	101
1	Glasgow	101
1	Glasgow	102

Part of the query used to produce this result is provided below:

```
SELECT Assignment.[Assignment ID], Assignment.Location,
Photograph.[Photograph Number] FROM
```

Copy and complete this query to produce the results shown in the table. **3**

13. (continued)

(*c*) The photographer wishes to find all assignments he has undertaken in Dundee, Dumfries and Dumbarton but not in Drymen or Dalkeith.

Using the "LIKE" statement, write the SQL needed to produce this result. **2**

(*d*) The sale of the photographs via the website makes use of *e-commerce platforms*.

Describe **two** features of e-commerce platforms. **2**

(*e*) A visitor to the website wants to view details of the cheapest photographs available.

(i) Write the SQL statement that will display details of the cheapest photographs available. **2**

(ii) Using a *server-side scripting language* with which you are familiar, write the code required to execute your SQL statement from part (*e*)(i) above. **2**

[Turn over

SECTION II

Part B—On-line Database Systems (continued)

Marks

14. GPS Ltd is a mapping company which provides personal navigation systems. The company has developed a device called a Ta-Ta which connects to a geographical information system and downloads and displays real-time maps and travel information for the user. The device has a touch sensitive screen and is small enough to be hand-held or mounted on the dashboard of a car. The user interface of the Ta-Ta is shown below.

(*a*) The device makes use of commercial software written by GPS Ltd. GPS Ltd is considering making the software for the Ta-Ta available as an *open source* project.

Evaluate the implications of this proposed action for:

(i) GPS Ltd; **2**

(ii) owners of the Ta-Ta device. **2**

(*b*) GPS Ltd has developed an upgrade to the current software which integrates mobile phone communications into the Ta-Ta device. The upgrade provides up-to-date traffic and weather information throughout the journey for any route entered into the system.

(i) What type of *maintenance* was required to add this new feature to the Ta-Ta? **1**

(ii) The upgrade includes a script to connect to an on-line geographical database. The details of the server storing the database are as follows:

Server name: geotata.co.uk
Server username: tatauser
Server password: gpsltd
Database name: geoinfosys

Using a scripting language with which you are familiar, write the code required to open a connection to this server and select the required database. **2**

14. (continued)

(*c*) The Ta-Ta device stores details of places of interest in a "Place of Interest" entity. The exact location of each place of interest is uniquely defined by its latitude and longitude (latitude is a value between -90 and +90; longitude is a value between -180 and +180). A sample record for the entity is shown below:

Category:	Restaurant
Name:	The Golden Spanner
Latitude:	55.895014
Longitude:	-3.076453
Last updated:	24/5/2009

Create a *data dictionary* for the "Place of Interest" entity. You should indicate the data type, size, validation and indexing required for each attribute in the entity. **4**

(*d*) A review for each place of interest is stored in a "Review" entity. Reviews can be created by Ta-Ta owners or by commissioned writers. Once created, a review can receive ratings and/or be edited by a review editing team. A review is removed from the entity when it is more than five years old or when a place of interest is deleted from the system.

Construct an *entity life history diagram* to illustrate the life span of the "Review" entity. **6**

[*END OF SECTION II—PART B*]

[*END OF QUESTION PAPER*]

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