Candidate surname | Other names

Pearson Edexcel
International
Advanced Level

Centre Number | Candidate Number

Time 2 hours

Paper reference **WIT13/01**

Information Technology
International Advanced Level
UNIT 3

You do not need any other materials.

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name,
  centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  – *there may be more space than you need*.

Information

- The total mark for this paper is 80.
- The marks for **each** question are shown in brackets
  – *use this as a guide as to how much time to spend on each question*.
- Calculators are **not** allowed.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ▶

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Pearson

Answer ALL questions.

Write your answers in the spaces provided.

1 A taxi company uses an IT system for scheduling and routing taxi journeys in a city.

(a) The system receives input from:
- each taxi
- cameras showing traffic conditions in the city
- the global positioning system (GPS)
- staff at the company's offices.

(i) Give **two** pieces of information that the system would need from each taxi.

(2)

1 ....

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2 ....

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(ii) Give **two** pieces of information, other than customer name and telephone number, that the system would need from the staff taking bookings.

(2)

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(b) One task of the system is route planning.

The system considers several factors when planning the best route for a journey.

Give **three** factors that the system should consider.

(3)

1 ....

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2 ....

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3 ....

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(c) Each taxi is equipped with a mobile device linked to the IT system.

The device can accept audio or touch input. The touch input is disabled while the taxi is moving.

(i) State **two** problems with having only audio input when the taxi is moving.

(2)

1 ....

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2 ....

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(ii) The taxi company wants to enhance the system by adding a haptic interface.

The interface will use feedback through the steering wheel to give directions to the driver when the taxi is moving.

Explain how such a system could work.

(3)

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(Total for Question 1 = 12 marks)

2 Large distributed databases process millions of queries and data updates every day across global networks.

(a) Give **three** reasons why it is better to use a distributed database rather than a single database at one location.

(3)

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3 ....

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(b) One of the problems with a distributed database is that of concurrency.

(i) State what is meant by concurrency in this context.

(1)

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(ii) Explain why concurrency might cause problems with a distributed database.

(3)

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(c) It is essential that a relational database is normalised.

Discuss the problems caused by data redundancy and how normalisation reduces the problems.

(6)

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(Total for Question 2 = 13 marks)

3 Members of a photography club store images in online albums.

The club wishes to create a database containing details of these images.

People will be able to view the images and leave comments.

Figure 1 shows an early draft of the database structure.

Photograph

Image ID
File name
Image description
Date uploaded
Photographer name
Photographer email
Photographer telephone

Album

Album title
Description
Number of views

Comments

Comment date/time
Comment text

Location

Location name

Figure 1

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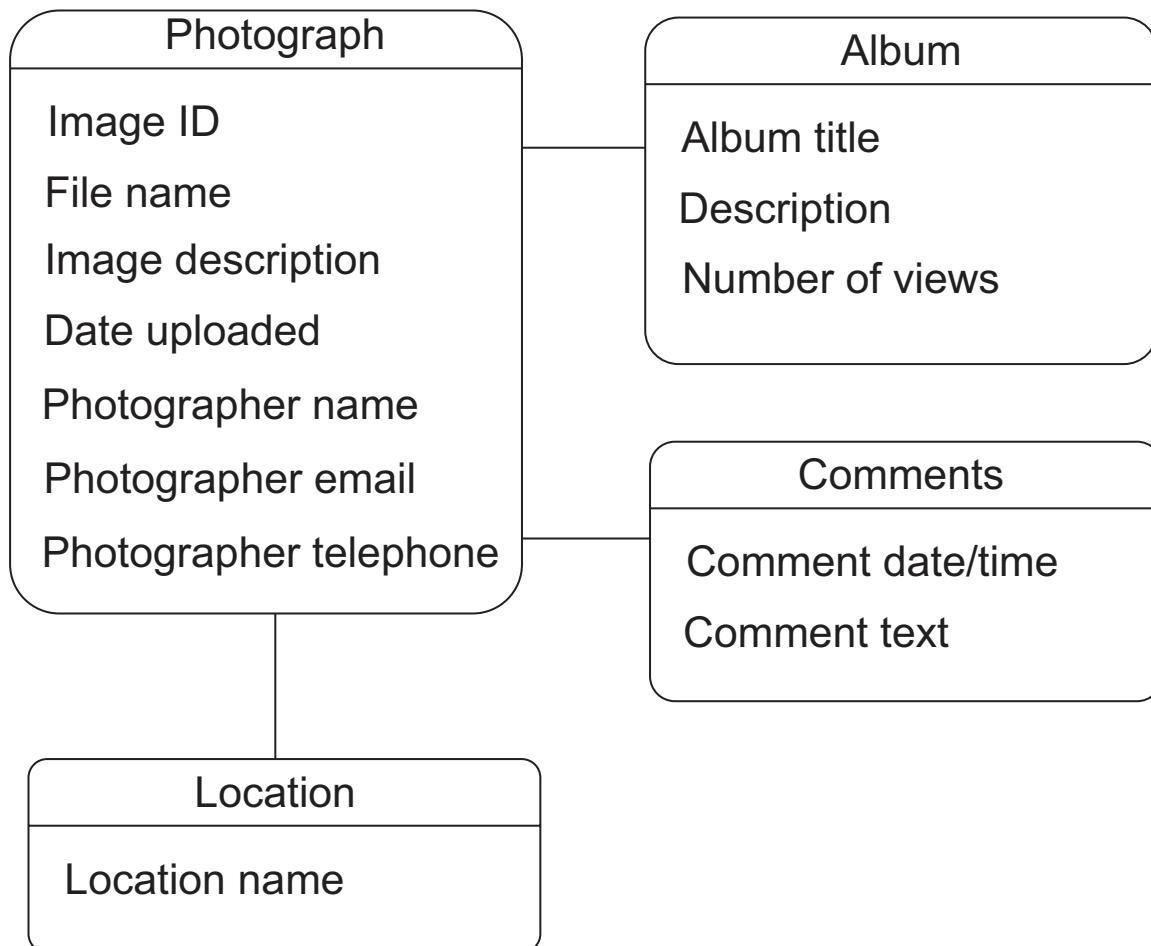
(a) Complete this data dictionary for the Photograph entity shown in **Figure 1**.

(6)

Table name				
Attribute / field name	**Data type**	**Key (P/F)**	**Field size**	**Format / validation**
Image_ID				
File_name				
Image_description				
Date_uploaded				
Photographer_name				
Photographer_email				
Photographer_telephone				

(b) Members of a photography club store images in online albums.

The club wishes to create a database containing details of these images.
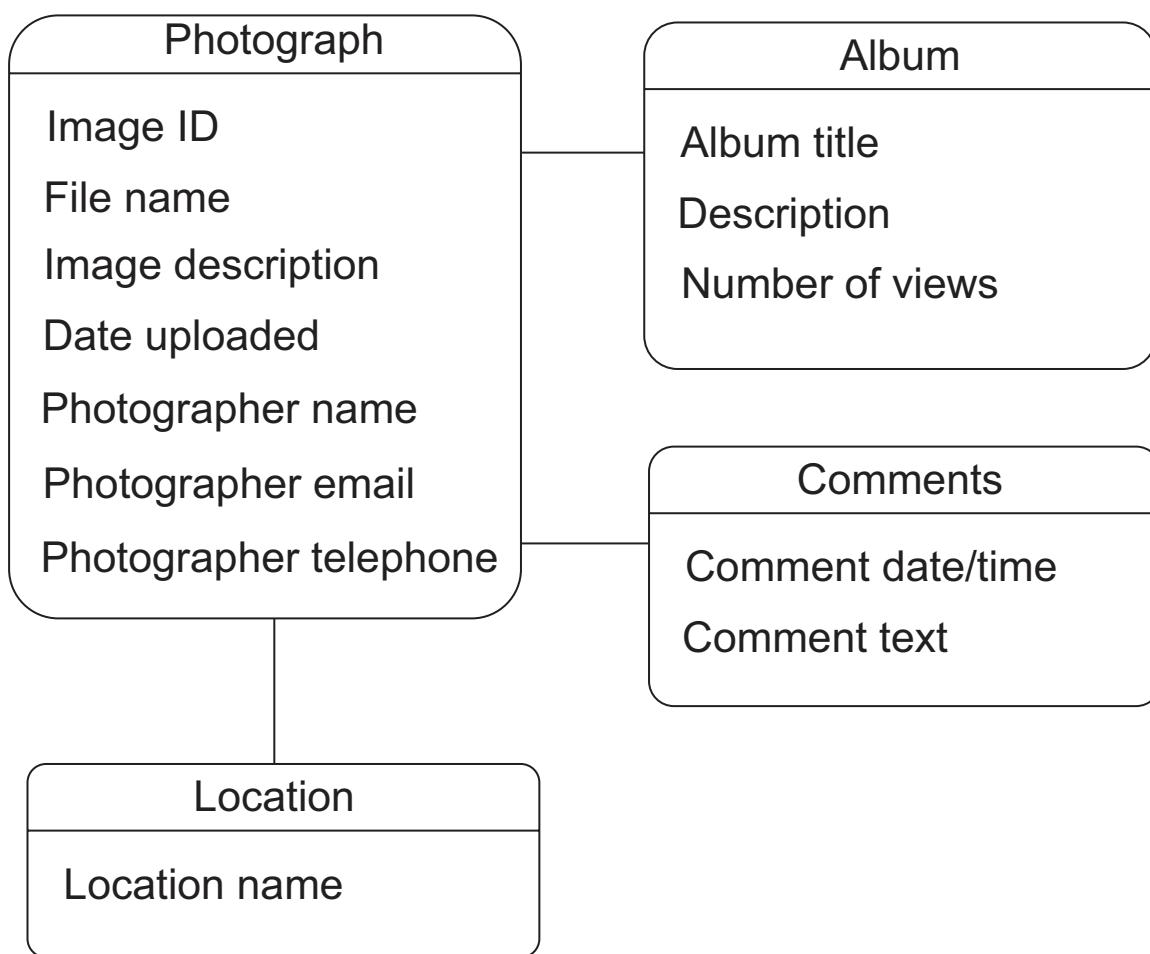
People will be able to view the images and leave comments.

A photographer may have several albums.

Each photograph is only stored in one album.

Figure 1 is repeated here.

It shows an early draft of the database structure.

Photograph

Image ID
File name
Image description
Date uploaded
Photographer name
Photographer email
Photographer telephone

Album

Album title
Description
Number of views

Comments

Comment date/time
Comment text

Location

Location name

The draft structure is not yet in third normal form.

Create an E–R diagram showing the normalised logical data model for this database.

All attributes must be included.

Primary keys must be underlined.

Foreign keys must be indicated by an asterisk *.

Relationship types must be shown.

(9)

Draw your ERD here.

(Total for Question 3 = 15 marks)

4 Good project management is important when developing an IT system.

(a) Explain **two** features of project management that contribute to a successful IT project.

(4)

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(b) A small company wants to replace its local area network (LAN) with a new one.

The project team will use the waterfall method.

The waterfall method involves six phases.

In each phase information is exchanged between members of the project team, and between the team and other stakeholders.

Evaluate the information exchange in each phase in this project and identify the most critical phase, explaining your choice.

(12)

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(Total for Question 4 = 16 marks)

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5 A smart lighting system is being designed for a new building. The system is intended to save energy by only lighting areas that are being used.

The lighting system will use Internet of Things (IoT) devices.
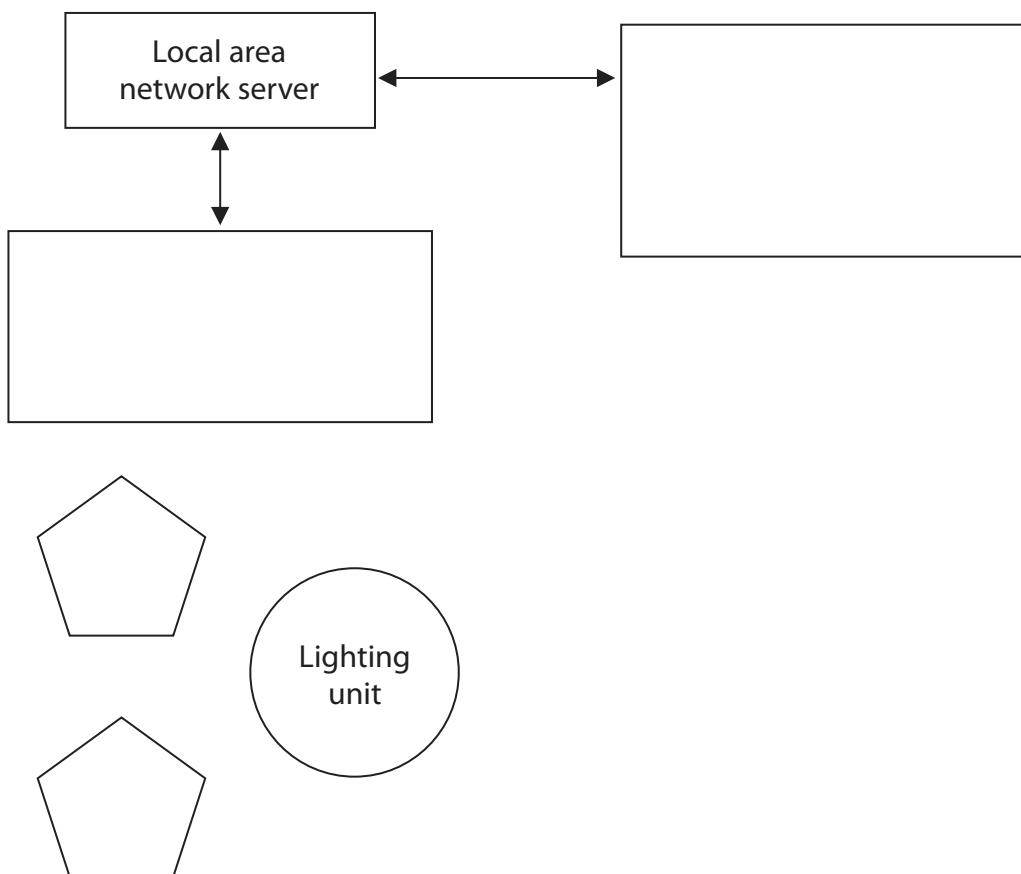
The system specification states that:

- the lights can be controlled by software on a local area network (LAN) server
- the lights can be controlled from an app on a mobile device using WiFi to the LAN
- individual lighting units will be connected to light and motion sensors
- lights will only come on/stay on if the area lit is below a brightness threshold
- lights will only come on/stay on if there is motion in the lit area or an adjacent area.

(a) Complete the diagram to produce a high-level design for a smart lighting system that will meet this specification.

Your diagram should include **three** lighting units to show how the system is connected. You only need to show sensors for one of the units.

(6)

Key:
Circle – lighting unit
Pentagon – sensor
Rectangle – device

(b) One part of the design process is the planning of system maintenance.

Discuss the role of system maintenance in a smart lighting system.

(6)

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(Total for Question 5 = 12 marks)

6 A research organisation has digital cameras installed at a site that attracts large numbers of animals. Each camera is paired with a motion detector and the camera is triggered if anything moves into its field of view.

The organisation has thousands of photographs and needs to examine all of them to identify the animals.

The organisation does not have enough staff to perform this task manually and wants to use machine learning instead. It is considering using either supervised learning (with a labelled dataset) or unsupervised learning (with an unknown dataset).

Evaluate the advantages and disadvantages of the use of the two types of machine learning **in this context**.

Your answer should include a justified recommendation of the type of machine learning the organisation should use.

(12)

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 80 MARKS

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