PRIFYSGOL ABERYSTWYTH UNIVERSITY

SEMESTER ONE 2025

COMPUTER SCIENCE

CSM3120 : MODELLING, MANAGING AND SECURING DATA

Time allowed: **2 HOURS**

Answer all **THREE** questions

All questions carry equal marks.

YOU MAY BRING THE FOLLOWING INTO THE EXAMINATION:
UP TO 3 SHEETS OF NOTES ON A4 PAPER (WHICH MAY BE DOUBLE-SIDED). THERE ARE NO ADDITIONAL RESTRICTIONS ON CONTENT OR FORMATTING OF THESE NOTES.
NO ELECTRONIC DEVICES.

CALCULATORS ARE NOT PERMITTED.

STUDENTS MAY SUBMIT ANSWERS TO THIS PAPER IN EITHER WELSH OR ENGLISH

Once seated, students may complete the front cover of the answer book(s) and the attendance slip ONLY.

DO NOT TURN THE EXAMINATION QUESTION PAPER OVER UNTIL INSTRUCTED TO DO SO.

1. This question concerns Data Ethics and the following module Learning Outcome:
Evaluate the legal, social, ethical and professional issues involved in handling data.

"Remixr" is an AI video startup who want to enable you to appear in any video. The company building an app where a user can 3d scan their own face and body in order to build a detailed 3d model of themselves. This can then be used to replace any actor in any video using so-called "deepfake" technology. Three types of data will be stored:

- **Individual model videos:** The 3d model will be built from video of the user in underwear to enable virtual clothing to fit the user naturally. This data will be stored indefinitely to make improvements to the 3d modelling algorithms.
- **Data to build profiles of the user:** Payment and address data will be stored. Also, the app will store information about the user's location, interests and preferences. This data will be stored as long as the user has an account on the app.
- **Target videos:** All users can upload videos that they can then insert themselves into. These "target videos" go into the public pool of videos and are shared between all app users. These will be stored indefinitely.

For example, **User A** (a parent) could upload a video of a school football match, and then use the app to replace the referee and all the spectators with **User A**. **User B** could "remix" the video again replacing any or all of the people in the video with **User B**.

a) Consider the different types of data that the company proposes to store. What reasons could the company give for storing the data? [3 marks]

b) What are the positive and negative ethical effects of the data usage of such a system? Do you think the proposed data use could be ethically justified? Consider using an ethics framework to structure your answer. [10 marks]

c) Assuming that the product will be sold in the UK, what is the legal position regarding the data use described here? What rights and responsibilities does the startup company have? Justify your answer with reference to the relevant legislation. [10 marks]

d) What steps could you recommend to the company that might minimise possible risks to the company, or harm to customers, associated with this data usage? [10 marks]

2. This question concerns data management and encryption, and pertains to the security related aspects of the following module Learning Outcome:

Design and structure databases appropriate to given problems, identifying potential issues of data persistence, resilience, security and verification of systems that process the data.

There are various elements known as “cryptographic primitives”. These include public key encryption, symmetric key encryption, cryptographically secure random number generators, and hash functions.

a) Explain the difference between public key encryption and symmetric key encryption. [8 marks]

b) Give an example of a task that public key cryptography is used for. [1 mark]

c) Explain briefly why public key is useful for the task you have named in 2(b). [4 marks]

d) You have been asked to build a secure data storage system for a robotic monitoring platform.

The requirements are as follows:

Requirement 1: There is a setup phase where the robot and dock are configured and the robot is paired with the dock.

Requirement 2: The robot collects data as it autonomously moves around a building. Data is encrypted securely on-robot.

Requirement 3: When the robot docks, the robot’s identity is confirmed, and then all data is uploaded to the docking station securely.

Requirement 4: The robot is only able to transfer data to the one docking station that it is paired with.

Describe how you might combine cryptographic primitives to make such a system paying attention to each requirement [10 marks]

e) Would the system you have just described be robust against attack based upon password / data loss or theft? Consider theft (or leakage) of robot, dock, and data. [10 marks]

3. This question concerns information security and cyberattacks, and pertains to the following module Learning Outcome:

Identify potential security issues with specific types of computer systems and the data they contain, and suggest mitigating strategies.

In 2025 Marks and Spencer suffered a large cyberattack taking out many systems for a sustained period of time. Two other major retailers were affected by the same attackers at around the same time.

The following questions pertain to that cyberattack. You should have researched this cyberattack in advance as part of your exam preparation.

a) Provide a one sentence overview of the cyberattack. [1 mark]

b) Technically speaking, what happened in the cyberattack? [6 marks]

c) What was the human impact of this cyberattack? [6 marks]

d) How did the company recover from the cyberattack, and what steps did they take to minimise damage? [10 marks]

e) Considering the CIA framework, was this an attack on Confidentiality, Integrity or Availability? Explain your answer. [5 marks]

f) What steps would you recommend for futureproofing against cyberattacks of this type? [5 marks]

END OF PAPER