CS

Case study

CHAPTER ASSIGNMENT · 24 MARKS

Name _____ Class _____ No. _____ Date _____

Answer every question in the space given. Show your working. You may use the chapter page to help you.

Questions from *Computer Science for the IB Diploma*, 1st edition (2025), Paul Baumgarten, Ioana Ganea, Carl Turland (Hachette Learning), for classroom use.

Past Case Study 1 — Blockchain (MONS) (pp. 487–488)

1 Pablo states: "In a traditional banking system, users trust the banks to keep everyone's money safe; but with MONS, the whole blockchain, right from the very first transaction, would be visible to all MONS users, so it is important to be able to explain to citizens how their money is guaranteed to be safe" (lines 109–112).

With reference to the key technologies, to what extent do you believe the MONS project will ensure the safety of the residents' money? [12]

IBDP Computer Science Paper 1, November 2020

2 Pablo has claimed that the use of blockchain technology for the MONS cryptocurrency will mean the cryptocurrency is both secure and scalable.

To what extent do you agree with Pablo? [12]

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Past Case Study 2 — Genetic Algorithms (pp. 488–489)

1. To what extent do the characteristics of genetic algorithms make them an appropriate approach to solving the route optimization problems? **[12]**

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2. The case study states: "Successful implementations of genetic algorithms strike a natural balance between exploration and exploitation, and techniques such as simulated annealing can fine-tune that balance as the algorithm progresses towards convergence" (page 7, Discussion).

   Discuss the role of convergence in genetic algorithms and how exploration and exploitation can affect its success. [12]

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Past Case Study 3 — Recommendation Systems (NextStar) (pp. 490–491)

1. "Recommender systems can use content-based filtering, collaborative filtering, or a combination of both. Hybrid recommender systems combine several machine learning algorithms." (lines 43–44)

   Discuss the advantages and disadvantages of these different approaches for building a recommendation system. [12]

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2. Discuss whether the challenges associated with the development of an effective recommender system can be overcome through the choice of algorithm, training data and methods of evaluation. **[12]**

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3 A recommender system that uses a supervised learning k-nearest neighbour (k-NN) algorithm is selected. Supervised learning algorithms require several decisions to be made, including setting any hyperparameters, choosing data sets, training and testing procedures, and evaluation strategies.

Discuss whether the selection and implementation of a k-NN algorithm in the development of a recommender system will give precise and accurate recommendations. [12]

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Past Case Study 4 — Rescue Robots (BotPro) (pp. 491–492)

1 A governmental department of disaster management is considering deploying rescue robots made by BotPro that use computer vision technologies for rescue operations in closed spaces, such as buildings and factories.

Discuss the benefits and costs of deploying rescue robots that use the vSLAM process and pose estimation techniques to carry out rescue operations in closed spaces. [12]

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2 vSLAM algorithms are designed to operate in GPS-denied or GPS-degraded environments. Rescue teams in these environments cannot rely on GPS tracking. BotPro wants your opinion on whether rescue robots installed with vSLAM algorithms will be effective when looking for injured or unconscious people in an emergency situation, such as a factory fire. Such emergencies are time critical.

Evaluate the effectiveness of robots that use vSLAM algorithms to find casualties in an appropriate timeframe. [12]

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End of assignment · Check your answers against the chapter at gurujazzy.com/subjects/ib-computer-science/case-study/