Diploma Programme
Programme du diplôme
Programa del Diploma

Information technology in a global society
Standard level
Paper 1

Wednesday 19 May 2021 (afternoon)

1 hour 30 minutes

Instructions to candidates

- Do not open this examination paper until instructed to do so.
- Answer two questions. Each question is worth **[20 marks]**.
- The maximum mark for this examination paper is **[40 marks]**.

2221 – 5512

6 pages

Answer **two** questions. Each question is worth [20 marks].

1. A cashless society

In the near future, it is possible that cash will not be accepted as a means of payment in Sweden. People are already using alternative ways of paying such as mobile payment, card payment and internet payment. Currently 94 % of citizens in Sweden have internet access.

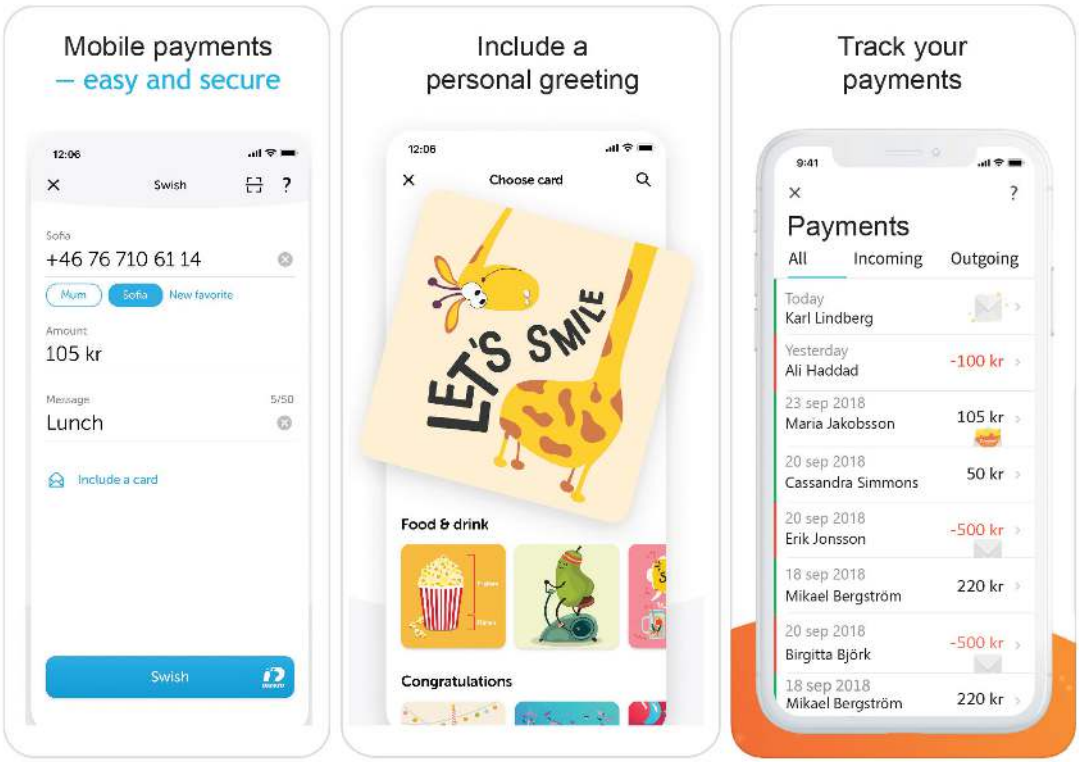
In 2012, a new payment app* called “Swish” was created that allowed users to transfer money using their cell/mobile phone. The user has to download the *Swish* mobile bank app to their cell phone and create a user ID. Once this has been done the user can register for Swish which connects their bank account to their cell/mobile phone number.

The *Swish* app can be used with all the Swedish banks. The maximum amount of money that can be transferred using the *Swish* app is controlled by the user’s bank.

Swish cannot be used if the user does not have a Swedish bank account. However, this only applies to less than 1 % of the Swedish population.

To make a payment using *Swish* you select a person in the contact list on your cell/mobile phone and follow a series of steps, see **Figure 1**.

Figure 1: The *Swish* app



The *Swish* app allows you to send money to friends, companies and organizations. However, it is not widely used when purchasing from a shop. In this case, credit or debit cards are still the preferred method for making payments.

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* app: small specialized program run on mobile devices, the internet, a computer or other electronic device

(This question continues on the following page)

(Question 1 continued)

(a) When a user wants to make a payment with the *Swish* app, the app will need to collect data about the transaction.

(i) Identify **two** items of data that the app could collect from the user making the payment. [2]

(ii) Identify the steps taken by the app to make the payment into the bank account of the person receiving the money. [4]

(b) Explain why it is important that any data sharing agreement between the *Swish* app and the Swedish banks has policies that address both the storing **and** sharing of app users' data. [6]

(c) Many people in Sweden have seen the advantages of using the *Swish* app. It allows friends to share a restaurant bill, to pay where credit or debit cards are not accepted, to easily pay for babysitting or parking tickets, or make a donation at church.

However, some people in Sweden have expressed concerns about not using cash and making the *Swish* app the only means of payment.

To what extent do the advantages of the *Swish* app as the only means of payment outweigh the disadvantages. [8]

2. Automatic crop watering system

Since 1990, Bertha Ascayo has been the manager of *El Pallar*, a farm in Chacra Province, where fruit trees are grown. In recent years, the climate has become more unpredictable and the farm has suffered from periods of drought, and Bertha is aware that she needs to manage the watering of her fruit trees more than she has had to in the past.

Bertha will need to make some improvements to the watering system by adding a rain sensor and use a computer program to automate the watering process. She has decided to use the proprietary software offered by the company that has installed the equipment for the watering of the trees.

By using this software, Bertha can program a different watering plan for each type of tree. This includes programming the days of the week, times of the day and length of the water cycle for each type of tree to be watered. For example, orange trees will be watered on Mondays and Thursdays at 6am for 45 minutes, and at 8pm for 30 minutes.

(a) (i) Identify **three** characteristics of proprietary software. [3]

(ii) A computer program uses the data provided by the rain sensor to decide whether to water the trees. Identify the steps in this program. [3]

(b) Water is becoming increasingly scarce in Chacra Province and the provincial government is concerned there will be a point when there is not enough water for all of the farms to water their crops or fruit trees.

To manage water for the watering of crops and fruit trees, the provincial government of Chacra Province intends to create a computer model to calculate how much water each farm in the province will receive.

Explain **three** factors that will contribute to the accuracy of the model. [6]

(c) The farmers of Chacra Province are concerned about the provincial government using a computer model to determine the amount of water they will be allowed to use to water their fruit trees.

To what extent should the farmers of Chacra Province rely on their knowledge and experience, rather than the computer-based solution provided by the provincial government, to manage the watering of the fruit trees? [8]

3. Technology disruption in Orams Academy

Many schools use virtual learning environments (VLE) such as Firefly, PowerSchool Learning, Schoology, Final Site LMS and Google Classroom. The VLE is used for document storage, lesson content and homework management as well as for communication between the school, students and parents.

In addition to the VLE, collaborative cloud-based online tools such as Google G Suite and Microsoft Office 365 are used by students and teachers.

Recently, Daniela Stark, the principal at Orams Academy, has become concerned that using only one VLE may not prove to be as beneficial as originally thought. She has heard that some teachers and students are also successfully using social media tools such as Facebook, Twitter or Instagram to share their learning. She has also been told that the lack of bandwidth that the school experiences at times can cause problems.

Daniela is considering an alternative approach and allowing teachers and students to choose the most appropriate tools to manage their learning.

(a) (i) Identify **two** characteristics of cloud-based storage. [2]

(ii) Identify **two** reasons why there might be a lack of bandwidth at times on the school's network. [2]

(iii) Identify **two** potential disadvantages of using online collaborative tools. [2]

(b) An acceptable-use policy will be required for the appropriate use of virtual learning environments and collaborative online tools in Orams Academy.

Explain **three** elements that would be included in an acceptable-use policy for Orams Academy. [6]

(c) Discuss whether Daniela should make every teacher at Orams Academy use the same learning platform **or** she should allow each teacher to choose their own preferred learning management approach. [8]

4. Voice simulation

Lyrebird voice cloning software was created by three university students from Montreal. This technology was originally developed to change the lives of people who have lost their voice. These people can use the software to create a new voice by choosing one from samples provided in the software.

However, *Lyrebird* can also clone voices. *Lyrebird* claims that it can clone a person's voice in just 60 seconds. Users only need to access the website, create an account and generate the voice-print by repeating a number of predetermined sentences. Although the cloning is not perfect, the developers of *Lyrebird* believe that both the time to clone the voice and the quality of the cloning will improve in the future.

The software allows the user to alter the speech and add emotion (such as, anger, elation, surprise, and so on), increasing the ways in which it can be used.

The initial voice-print for the cloning process requires the most time and a lot of computing power. However, creating speech from the voice-print is a simple process, generating around 1,000 sentences almost instantly. The voice print is saved as a compressed audio file.

Lyrebird has considered the ethical issues regarding this technology and acknowledges that it highlights some key societal issues. Lyrebird has taken the decision to make the software available to all in an attempt to address these issues.

(a) (i) *Lyrebird* uses a person's voice-print to determine their identity.

Identify **two** other methods of biometric identification that could be used to determine a person's identity. [2]

(ii) Identify **two** audio file formats that could be used to store the voice-print. [2]

(iii) The voice-print created can be compressed using lossless or lossy compression.

Describe the difference between lossless and lossy compression. [2]

(b) Analyse whether it would be appropriate for *Lyrebird* to release the biometric data of a user to a third party. [6]

(c) To what extent do the benefits of using *Lyrebird*'s voice cloning software outweigh the concerns that may arise from its use? [8]

References:

1. Images with permission from Getswish AB.