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INFORMATION TECHNOLOGY IN A GLOBAL SOCIETY
STANDARD LEVEL
PAPER 2

Friday 6 May 2011 (morning)

2 hours

INSTRUCTIONS TO CANDIDATES

- Do not open this examination paper until instructed to do so.
- Section A: answer all parts of the question.
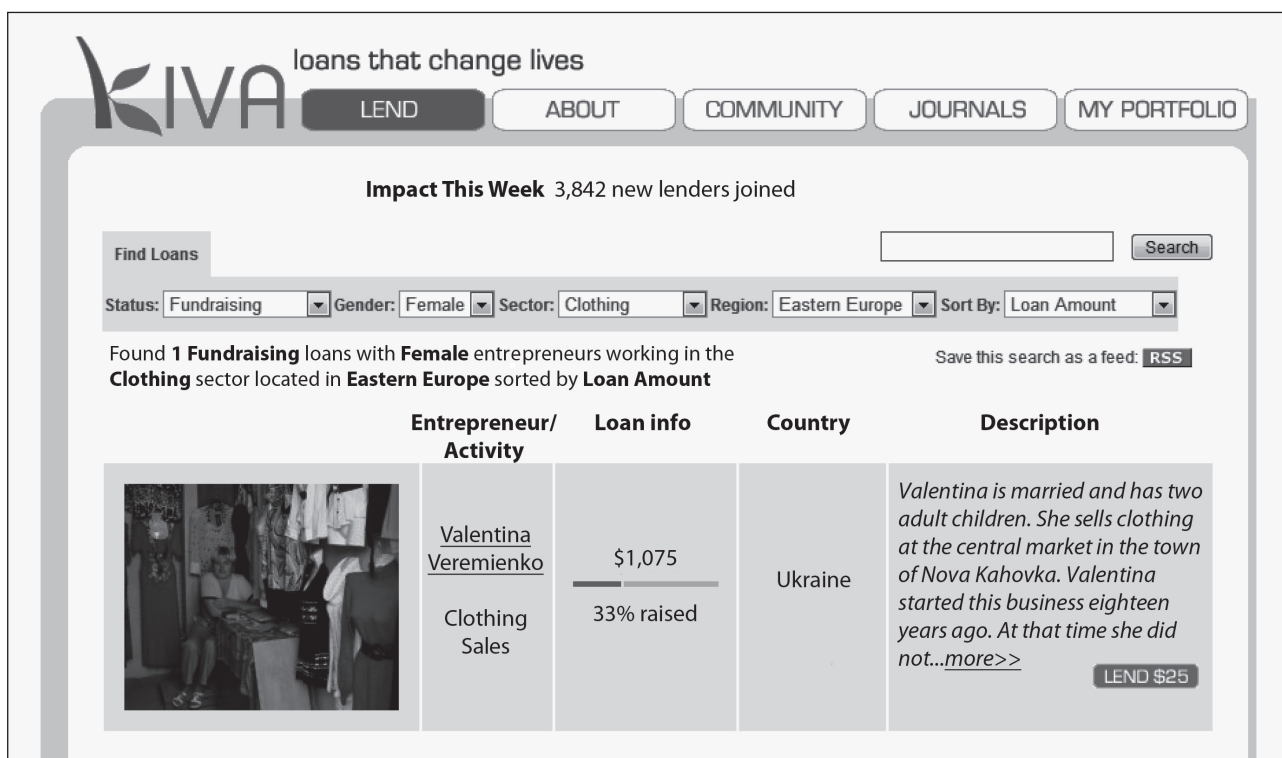- Section B: answer two questions.

SECTION A

*Answer **all** parts of the question.*

Area of impact: Business and employment

1. *Kiva* is a company that lends money to small businesses in the developing world. Details of each business are displayed on the *Kiva* web site. New businesses wanting loans can sign up, at no cost, and individuals who wish to lend money can register as lenders. Lenders can search the *Kiva* database and choose a new business from countries such as Kenya and Vietnam.

    Lenders transfer money to the *Kiva* web site in the form of a loan using *PayPal* or a credit card. Lenders may lend as little as US$25 so a loan is usually shared by many lenders. The loan is complete when the total of individual lenders' loans equals the sum required by the business owner. Provided the business is successful the business owner gradually repays each loan.

    Regular electronic feedback is provided to the lenders on the status of their loans and the success of the business. Lenders can also log in to the web site at any time and check current and past loans. Download speeds vary and are often slow in developing countries. Lenders find information about the progress of each loan useful and it makes them feel valued. This often encourages further loans.

www.kiva.org. Used with permission.

(This question continues on the following page)

(Question 1 continued)

(a)   The information about loans is stored in a relational database such as the one illustrated below.

LENDERS	LOANS	RECEIVER_OF_LOAN (*i.e.* BUSINESS)
Lender_ID First_Name Family_Name Street City Country Email_Address Payment_Method	Loan_ID Business_ID Lender_ID Amount_Loaned Date_Loaned	Business_ID Business_Name Business_Description Contact_Name Address Phone_Number Loan_Status

(i)   Identify the key field in the RECEIVER_OF_LOAN table.   *[1 mark]*

(ii)   Identify the data type for the field Phone_Number in the RECEIVER_OF_LOAN table.   *[1 mark]*

(b)   The database administrator wishes to produce an alphabetical list of lenders from France who have contributed at least US$50 after 01/01/2001.

Describe the query that produces the list specified above.   *[4 marks]*

(c)   The field Business_Description should not be included in the LOANS table because this would lead to data redundancy.

Explain why this could lead to inaccuracies in the database.   *[4 marks]*

(d)   "*Kiva* provides a data-rich, transparent lending platform. We are constantly working to make the system more transparent to show how money flows throughout the entire cycle, and what effect it has on the people and institutions that lend, borrow and manage it along the way."

www.kiva.org. Used with permission.

Discuss what online services the *Kiva* web site could provide for effective online reporting back to the lenders about the status of the recipient's business and the loan repayments.   *[10 marks]*

Turn over

SECTION B

*Answer **two** questions.*

Area of impact: Education

2.   Universities are taking advantage of the increased availability of mobile devices such as personal digital assistants (PDAs), including cell (mobile) phones, to provide access to video and audio files of material covered in lectures. These files may be podcasts[1] and vidcasts[2] which are accessed securely from the university server.

Many students, such as Amy who is an international athlete, are unable to attend a number of their lectures due to other commitments. These students, like Amy, are taking advantage of the opportunity to access the material covered in lectures to keep up with their studies.

However, there are other students who are taking advantage of this technology to socialize and earn money at part-time work, knowing that the lectures they miss are available through the university network.

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[1]   podcast: refers to an audio-only file
[2]   vidcast: refers to a podcast with video

(a)   Identify **two** file formats that can be used for podcasts or vidcasts on PDAs.   *[2 marks]*

(b)   Describe the steps for producing a podcast file.   *[4 marks]*

(c)   Explain **two** possible educational uses for podcasts or vidcasts other than providing access to lecture material.   *[4 marks]*

(d)   Many universities around the world are also making their lectures publicly available through online podcast and vidcast hosting services. The lectures cover a wide range of topics, opening up new opportunities for lecturing and learning.

To what extent could stakeholders, other than students enrolled in the university courses, be affected by the public availability of university lectures as podcasts and vidcasts?   *[10 marks]*

Area of impact: Arts, entertainment and leisure

3.   A social games company, *PlayFish*, announced that its users installed 100 million copies of its new social games in the first 18 months since the company began.

One of their social games is called *Pet Society*. When you join as a member you are able to contact other members, called "friends", and contact their cartoon pets. You are only allowed to visit a "friend's" pet once a day, where you earn 30 virtual coins. Items can be bought for "friends" and pets which can cost thousands of coins. It takes weeks of playing in order to buy these items. Therefore the aim of the game is to acquire as many "friends" as possible.

Recently one player, Chui, had more than 4400 "friends". Through playing *Pet Society* she is online for more than 8 hours each day. Because of her vast "friend" network, Chui is the most popular member in *Pet Society*.

Image removed for copyright reasons

Social games are normally free. They provide the opportunity for users to communicate with each other online and play collaboratively to achieve the goals in the game. Users play the games in their web browsers through social networking web sites such as *Facebook*.

According to gaming experts, the emphasis on online interaction between "friends" has expanded the popularity of social games far beyond both video games on desktop computers and online games. Moreover, social games appeal to an entirely new, non-gaming, audience.

[Source: http://gamasutra.com/php-bin/news_index.php?story=25173, 25 September 2009]

(a)   Identify **two** reasons why a social networking web site such as *Facebook* would provide access to free online social games through its web site.   *[2 marks]*

(b)   *Pet Society* downloads cookies on to your computer. Describe **two** possible ways that games companies could use cookies.   *[4 marks]*

(c)   Online social games sometimes run slowly on home computers. Explain the factors that can cause this problem.   *[4 marks]*

(d)   To what extent could the intensive playing of online games have long-lasting effects on the user?   *[10 marks]*
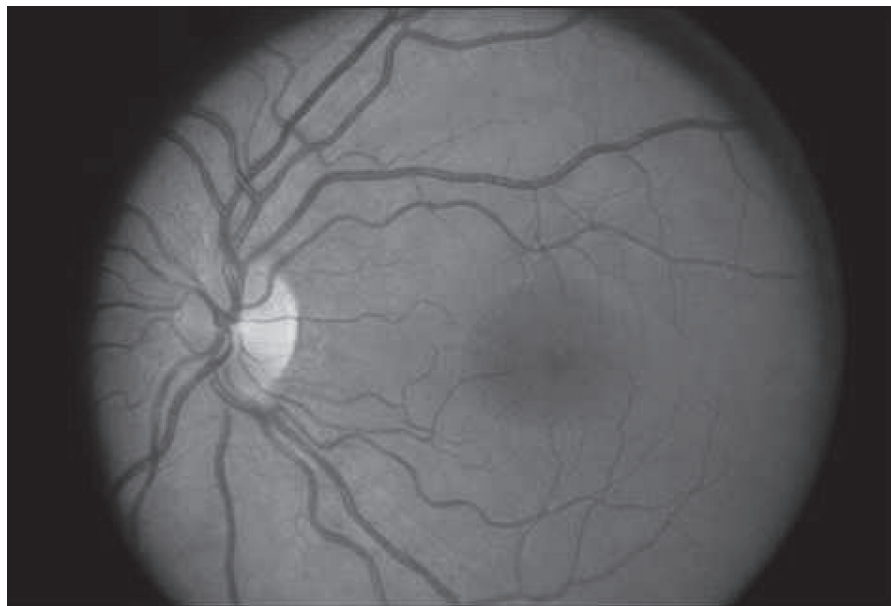
Area of impact: Health

4. *2020 Vision* is a firm of opticians in the UK (United Kingdom) that conducts eye examinations and prescribes glasses and contact lenses. During an eye examination they take digital photographs of customers' retinas using a 6 megapixel camera and store them on their computer system. By comparing them with previously stored photographs, the opticians can see if there have been any changes which may indicate eye disease. The images are converted to JPG format and placed in a secure area on their web site. Customers can log in and see their photographs as well as their prescriptions at any time.

[Source: http://visionsking.com/prescription, 25 September 2009]

[Source: http://depts.washington.edu/ophthweb/images/J01retina.jpg, 25 September 2009]

Up until now UK medical institutions and services such as *2020 Vision* store their patient medical records in different IT systems. The UK government has already spent billions of pounds of taxpayers' money on an IT medical records system which is supposed to provide medical professionals with access to all patients' records from any computer connected to the government system. The project had problems from the start and it looks as if it will never be satisfactorily completed. It has been suggested that a better solution would be to allow another established Internet company, *MedSystems*, to store UK patients' medical records using technology that is already available.

(This question continues on the following page)

(Question 4 continued)

    (a)   Define the term *pixel*.   *[2 marks]*

    (b)   Describe **two** steps that would need to be taken for a patient's *2020 Vision* images to be made available in *MedSystems*'s medical records.   *[4 marks]*

    (c)   Explain why images of the retina need to be converted to JPG format before being displayed on the *2020 Vision* web site.   *[4 marks]*

    (d)   The UK government has to decide whether to:
- continue to fund the current IT medical records system in an attempt to get it working
- abandon this development and outsource a similar records system to a third party such as *MedSystems*.

        Evaluate both of these strategies.   *[10 marks]*

Area of impact: Science and the environment

5. A government bureau of meteorology collects data from weather stations. This data is imported into a database and displayed on a web site.

On the web site (Diagram 1) it is possible for a user to select a particular weather station, *e.g.* 23090, and display data such as temperature, rainfall and other weather conditions, and to choose daily or monthly statistics.

Diagram 1

Source: http://bom.gov.au. Commonwealth of Australia permission.

(This question continues on the following page)

(Question 5 continued)

This data is also used for climatic modelling and is used by companies who need additional analysis of the information provided. This data is stored in the form of spreadsheets.

When station 23090 is selected the screen displays a snapshot of data from Adelaide Hyde Park (Diagram 2). Collection began in 1977 and continues to the present day.

Diagram 2

Monthly rainfall
ADELAIDE (HYDE PARK)

ⓘ About this page | About monthly rainfall   🕐 ▦ Data file (csv) | 📄 Print file (pdf)

Site name: ADELAIDE (HYDE PARK)   Site number: 23090   Commenced: 1977
Latitude: 34.92° S   Longitude: 138.62° E   Elevation: 48 m   Operational status: Open   Map

Key: Units are millimetres.   *12.3* = Not quality controlled.

Highlight data in table: No highlight ▼   ⓘ Period for calculating statistics: ◉ All years   ○ 1961-1990

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Plot	▥	▥	▥	▥	▥	▥	▥	▥	▥	▥	▥	▥	▥
1977	4	17	34	26	43	59	23	27	48	47	37	15	380
1978	3	7	9	47	53	108	112	69	84	27	46	23	588
1979	40	12	6	71	64	32	74	102	123	66	34	36	660
1980	5	0	0	68	44	98	81	21	24	105	45	35	526
1981	22	4	63	1	60	175	110	112	45	25	30	24	671
1982	21	8	43	67	51	55	32	26	28	15	1	10	357
1983	13	1	106	105	71	48	111	91	69	52	8	17	692
1984	31	3	29	33	52	31	82	109	63	25	53	7	518
1985	4	1	53	45	88	60	44	78	68	38	23	60	562
1986	8	1	2	63	45	37	160	107	70	69	10	33	605
1987	29	25	23	27	128	100	116	30	16	39	6	36	575

Source: http://bom.gov.au. Commonwealth of Australia permission.

(a)   Identify **two** methods of updating a database with data from a spreadsheet.   *[2 marks]*

(b)   A spreadsheet will be unreliable if data has been entered incorrectly.

       Describe **two** ways to prevent the input of invalid data.   *[4 marks]*

(c)   The output from the spreadsheet (Diagram 2) contains valuable data for users of the web site. Compare **two** different ways a user may choose to save copies of this data to a personal computer (PC).   *[4 marks]*

(d)   Many companies create their own spreadsheets so they can use the data from the government bureau of meteorology web site in order to assist in their decision-making. Results are often limited due to poor design, maintenance or control of these spreadsheets.

       Discuss the policies that a company can implement to overcome such problems.   *[10 marks]*

Area of impact: Politics and government

6. In some countries all vehicles are taxed annually. However, before the tax can be paid, the owner needs valid insurance and a current safety certificate. A tax sticker is then issued and must be displayed in the vehicle.

In the month before the vehicle tax must be paid, the owner receives a renewal letter that has a 16-digit unique identification number that must be used when paying the tax. In order to make the payment, the owner has to go to a post office with the vehicle insurance and other relevant documents as well as the vehicle tax renewal letter.

The UK (United Kingdom) government has introduced an online system so that the vehicle owner can make the payment of the vehicle tax online.

When the vehicle owner accesses the web page, they are asked to enter the 16-digit identification number. At various points in the process the vehicle owner is asked for additional relevant information that must also be entered.

During the renewal process the government system accesses a database to find out whether the vehicle owner has valid insurance and also checks that the vehicle has a current safety certificate. If at any point the vehicle owner gives an incorrect, invalid or unexpected response that they cannot correct, then they will not be able to complete the process.

At the end of the process the vehicle tax payment is authorized and a new tax sticker is sent by post to the vehicle owner.

The UK government is considering extending this online scheme to include other types of payment such as property tax.

(a) Identify **two** reasons why the UK government is encouraging people to pay their vehicle tax online.   *[2 marks]*

(b) When paying the vehicle tax online, the URL of the vehicle tax web site uses the protocol HTTPS. Describe the difference between HTTP and HTTPS.   *[4 marks]*

(c) Explain how the UK vehicle tax database system could make use of private key/ public key encryption in order to safeguard an owner's data.   *[4 marks]*

(This question continues on the following page)

(Question 6 continued)

(d)   The UK government has access to a range of other databases such as:
   •   vehicle registration database
   •   income tax database
   •   police records
   •   cell (mobile) phone records
   •   credit card records
   •   Internet service provider (ISP) records of web sites visited.

Data matching techniques allow the government to collate information from numerous sources and build up a comprehensive picture of an individual. Civil liberty groups are concerned about the amount of information that governments hold, the amount of access they have to other databases and how they use it.

With reference to specific examples, to what extent are the concerns of the civil liberty groups justified?   *[10 marks]*