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**Information technology in a global society**  
**Standard level**  
**Paper 1**

Friday 5 November 2021 (afternoon)

1 hour 30 minutes

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**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]**.

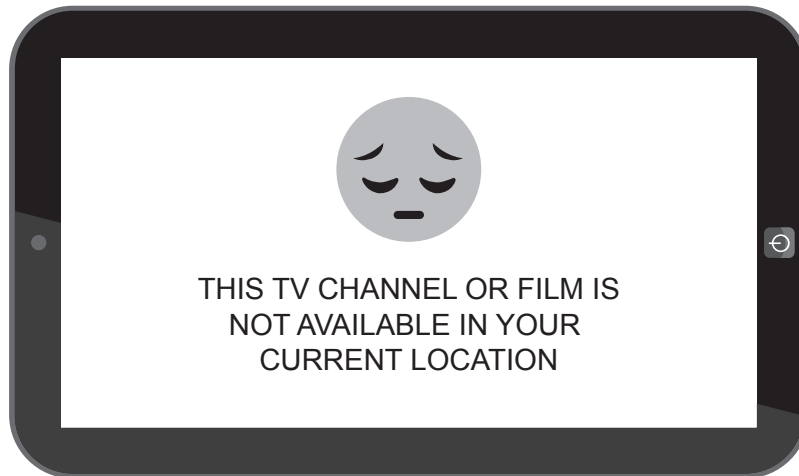
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Answer **two** questions. Each question is worth [20 marks].

**1. Accessing online media**

Rajesh frequently travels for his job and has found that he is unable to watch his favorite films and TV channels when abroad (see **Figure 1**). He has been informed that he can subscribe to an internet protocol television (IPTV) service or use a virtual private network (VPN) to stream or download this content.

**Figure 1: An example of blocked content**



- (a) (i) Identify **two** hardware devices that Rajesh could use to view his internet protocol television (IPTV) channels. [2]
- (ii) Identify **two** characteristics of an IP address. [2]
- (iii) Rajesh is downloading a film for offline viewing. The download speed is 80 mbps.  
Calculate the amount of data, in megabytes (MB), that will be downloaded in 10 minutes. [2]
- (b) (i) Explain why Rajesh downloaded the films rather than streaming them when he was travelling. [4]
- (ii) Rajesh has been told that subscribing to an internet protocol television (IPTV) service may compromise his anonymity.  
Distinguish between anonymity and privacy. [2]
- (c) To what extent is it acceptable for Rajesh to use services like a virtual private network (VPN) to access content that may be blocked in the country he is visiting? [8]

**2. Singapore shipping**

*SingShip* is a cargo shipping company based in Singapore. It transports goods between ports in Southeast Asia. The company is planning to expand its services to 10 more destinations.

In *SingShip*'s head office, staff use a range of software, such as word processing, databases and spreadsheets (see **Figure 2**).

**Figure 2: Excerpt from a spreadsheet used by *SingShip***

	A	B	C	D
<b>1</b>	<b>Shipment_ID</b>	<b>Shipment_Date</b>	<b>Containers_Used</b>	<b>Destination</b>
<b>2</b>	SS-567	12-Sep-20	232	Singapore
<b>3</b>	SS-568	15-Oct-20	223	Klang
<b>4</b>	SS-569	18-Oct-20	546	Tanjung Pelepas
<b>5</b>	SS-570	15-Nov-20	345	Chennai
<b>6</b>	SS-571	22-Dec-20	656	Laem Chabang
<b>7</b>	SS-572	12-Jan-21	234	Ho Chi Minh City
<b>8</b>	SS-573	18-Jan-21	235	Singapore
<b>9</b>	SS-574	21-Feb-21	633	Singapore
<b>10</b>	SS-575	11-Mar-21	435	Tanjung Priok
<b>11</b>	SS-576	18-Mar-21	347	Ho Chi Minh City
<b>12</b>	SS-577	21-Apr-21	235	Ho Chi Minh City
<b>13</b>	SS-578	28-Apr-21	545	Klang
<b>14</b>	SS-579	18-May-21	447	Tanjung Pelepas
<b>15</b>	SS-580	21-May-21	564	Mumbai

- (a) (i) Identify **two** reasons why a spreadsheet would be used to store the information in **Figure 2**. [2]
- (ii) State the formula to calculate the total number of containers used in Column C. [1]
- (iii) State the data type for the column headed **Shipment\_Date** (column B). [1]
- (iv) Outline **one** reason why *SingShip* would use mail merge when producing letters for customers to advise them about their shipments. [2]

**(This question continues on the following page)**

**(Question 2 continued)**

- (b) (i) Distinguish between data validation and data verification. [2]

The product development life cycle (PDLC) was used to develop the database for *SingShip*.

- (ii) Explain **one** advantage for *SingShip* of using a development methodology, such as the product development life cycle (PDLC). [2]

- (iii) Explain **one** disadvantage for *SingShip* of using a development methodology, such as the product development life cycle (PDLC). [2]

- (c) The head of IT at *SingShip* has recommended that all the information stored by the company in various spreadsheets should be integrated into a single relational database.

Evaluate this decision. [8]

### 3. Smart farming

A government in East Africa is using the expertise of scientists at a university in the region to promote the culture of smart farming and increase the productivity of farmers (see **Figure 3**).

**Figure 3: An example of farming in East Africa**



The new smart farming system uses a mobile app<sup>1</sup> that connects to a data logger<sup>2</sup> using Bluetooth technology (see **Figure 4**).

**Figure 4: Example of a data logger**



The data collected by the app is sent to the university by lossless compression.

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<sup>1</sup> apps: small specialized programs run on mobile devices, the internet, a computer or other electronic device

<sup>2</sup> data logger: a device that records data over time

**(This question continues on the following page)**

**(Question 3 continued)**

- (a) (i) Identify **two** zip file formats. [2]
- (ii) Identify **two** characteristics of Bluetooth. [2]
- (iii) Identify **two** types of data collected by the sensors in the data logger. [2]
- (b) (i) Explain **one** advantage of using lossless compression to send the data to the university. [2]
- (ii) Explain **one** disadvantage of using lossless compression to send the data to the university. [2]
- (iii) Explain why protocols are used when data is sent from one computer to another. [2]
- (c) The scientists who developed the app have received many complaints from farmers who have been unable to use it. They are considering two options:
- Making the existing system more user friendly.
  - Educating the farmers to use the existing system.
- Evaluate these two options. [8]



#### 4. Human genome research

*MediResearch*, a US-based DNA testing company, has a relational database of human genome information. An individual’s genome data represents private information about their past, their present and, potentially, their future. This information is stored in a relational database.

The senior managers at *MediResearch* are considering using data mining but are concerned this may compromise the anonymity of the individuals who have provided their DNA.

- (a) (i) State the role of a primary key in a relational database table. [1]
  - (ii) State the role of a foreign key in a relational database. [1]
  - (iii) Identify **two** reasons why a relational database, rather than a flat-file database, is used to store the data for *MediResearch*. [2]
  - (iv) Identify **two** features of data mining. [2]
  - (b) *MediResearch* is looking to expand access to the genome data it holds by sharing it with other companies.  
  
Explain **three** strategies that *MediResearch* could use to ensure the security of the genome data. [6]
  - (c) The chief executive officer of *MediResearch* is considering using cloud-based storage to store the genome data.  
  
Discuss whether *MediResearch* should move to cloud-based storage. [8]
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#### References:

**Figure 3.** Palmer, N., 2010. A farmer at work in Kenya’s Mount Kenya region [image] [online] Available at: [https://commons.wikimedia.org/wiki/File:2DU\\_Kenya\\_86\\_\(5367322642\).jpg](https://commons.wikimedia.org/wiki/File:2DU_Kenya_86_(5367322642).jpg) (CC BY-SA 2.0) <https://creativecommons.org/licenses/by-sa/2.0/deed.en> [Accessed 18 May 2020].