| **logobw**  CANDIDATE NAME  CT GROUP | VICTORIA JUNIOR COLLEGE  JC 2 TIMED PRACTICE  Higher 2  **…Marking Scheme and Solutions……………….…………………….………..**  **……………………………..** | | |
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| **COMPUTING** | | **9569/01** | |
| **Paper 1**  Additional Materials: ets.txt data file  Electronic version of Carpets.txt data file | | | **8 March 2023**  **1 hour** |
| **READ THESE INSTRUCTIONS FIRST**  An answer booklet will be provided with this question paper. You should follow the instructions on the front cover of the answer booklet. If you need additional answer paper, ask the invigilator for a continuation booklet.  Answer **all** questions. Approved calculators are allowed.  The number of marks is given in brackets [ ] at the end of each question or part question. The total number of marks for this paper is 30.     | **For Examiner’s Use** | | | --- | --- | | **Total** | **/ 30** | | | | |

1. The ASCII standard defines how numbers are used to represent common characters that can be typed using a keyboard, such as upper-case and lower-case letters.

Besides ASCII, Unicode is another method of encoding characters.

Describe **one** difference between ASCII and Unicode. [1]

| * ASCII uses 7 bits of a byte to represent a character * Unicode uses 8-bit, 16-bit or 32-bit encoding * ASCII is less demanding on memory use than Unicode * Unicode occupies more space and is more demanding on memory than ASCII * Unicode represents a wide range of characters including different languages, mathematical symbols and emojis * Unicode can represent a greater range of characters than ASCII |
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1. Telemedicine or telehealth can improve access to care for patients, especially with an ageing population and increasing incidence of diseases in Singapore. In telemedicine, doctors may be able to interact with other healthcare professionals, providers, caregivers and patients virtually using Information Communication Technologies (ICT).

Through such a system, the above users can interact with one another in the following areas:

* Telesupport such as scheduling appointments and collaboration
* Teleconsultation such as assessing, managing and monitoring patients

Explain **two** benefits of a web-based solution over native application in this situation. [2]

| Explanation should include any two of the following points in the context of the question.   | **Native Applications** | **Web Applications** | | --- | --- | | Developed for a specific operating system or platform.  As native apps are confined to a standalone machine, they can only be accessed from the machines they are deployed in. | Developed to be accessed via the device’s internet browser.  Web applications can be accessed from anywhere (most locations), so there is no location constraint. | | Need to be installed in the device to function.  Native applications need to be developed separately for different platform machines. (Windows, Linux, Unix, Mac etc) | No need to be downloaded or installed.  Web applications are platform-independent, they can work on different types of platforms with the only requirement of a web browser. | | May incur maintenance and update costs.  Deployment and any maintenance/patch are done on individual client machines separately. | Updated automatically.  Deployment and maintenance (updates) for a web-based application require deployment on a single set of server machines. | |
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1. The following is a design blueprint of the Layers module in a software.

Graphical user interface

Description automatically generated

In the Layers module, users can move layers around using the cursor. They can visually see the layer being represented as physically dragged within the module. The cursor also changes from an open hand into a gripped hand when the user drags a layer around.

Describe **two** usability principles that are applied in designing the above dragging of layers. [2]

| The cursor graphic goes from representing an open hand to a gripped hand when the user drags a layer around within the Layers palette. This makes it easier to instantly understand the system status. [1]  Additionally, the choice of using a ‘hand’ is a great example of the second guideline where the system matches the real world. [1] |
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1. Read the following problem scenario, then answer the following questions:

A travel booking website offers accommodation services to customers. A customer usually makes a booking a few months before the start of the rental period. The customer pays a deposit at the time of the booking and the balance (the remaining money owed) a month before the start of the rental.

At the time of a booking, the company records the following data:

* customer name and address, if the customer has not made a booking before.
* customer reference code
* booking date
* rental start date
* rental completion date
* accommodation type
* deposit taken

Accommodation types are coded as follows:

* H1 for hotel room
* A1 for one-bedroom apartment
* A2 for two-bedroom apartment
* A3 for three-bedroom apartment

Each accommodation type has its own daily rental features such as its daily rental rate, add-ons such as extra beds. Each accommodation has a unique number. Each customer may make more than one booking.

The company wants to model this application using a relational database.

* 1. A database needs several tables to store the data for this application.
     1. Draw the Entity-Relationship (E-R) diagram to show the tables in third normal form (3NF) and the relationships between them. [7]

| Entities:   * Customer (with attributes: customer name, address, customer reference code) [1] * Booking (with attributes: booking date, rental start date, rental completion date, deposit taken) [1] * Accommodation (with attributes: accommodation type, daily rental, unique number) [1] * Rental Features (with attributes: daily rental rate, extra beds) [1]   Relationships:   * A customer can make many bookings (one-to-many relationship between Customer and Booking) [1] * A booking is associated with one accommodation (many-to-one relationship between Booking and Accommodation) [1] * A rental feature is associated with many accommodations (one-to-many relationship between Rental Features and Accommodation) [1] |
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* + 1. A table description can be expressed as:

TableName (Attribute1, Attribute2, Attribute 3,...)

The primary key is indicated by underlining one or more attributes. Foreign keys are indicated by using a dashed underline.

Using the information given, write table descriptions for the tables you identified in part **(a)(i)**. [7]

| Table 1: Customer Attributes:   * Customer Reference Code (primary key) [1] * Customer Name * Address   Table 2: Booking Attributes:   * Customer Reference Code (foreign key) * Booking Date * Rental Start Date (primary key) [1/2] * Rental Completion Date * Accommodation Number (primary, foreign key) [1/2] * Deposit Taken [1]   \*Booking Date and Rental Start and Completion Dates [1]  Table 3: Accommodation Attributes:   * Accommodation Number (primary key) [1] * Accommodation Type Code (foreign key) * Accommodation Type Name   Table 4: RentalFeatures   * Accommodation Type Code (primary key) [1] * Daily Rental Rate * Addon Extra Bed   All 3 foreign keys [1] |
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* 1. The company wishes to expand its services globally, offering various types of accommodation services such as hotels, apartments, and villas. The database will be expanded to include a wider range of information about each accommodation, such as its location, availability, and amenities. Furthermore, the company is looking to handle a large volume of data and support high scalability.

State **two** reasons why the company may wish to deploy a NoSQL DBMS. [2]

| Reasons why the company may wish to choose a NoSQL DBMS are:   * **Flexibility:** NoSQL databases are highly flexible and can handle different types of data structures, including unstructured data such as multimedia files, web pages, and documents. This flexibility enables the company to store and retrieve data in a variety of formats, which may be useful for accommodating different types of accommodation and their related information. (New fields can be added without making changes to existing schema) * **Scalability:** NoSQL databases are designed to scale horizontally, which means that they can handle large volumes of data and support high traffic loads without compromising performance. This scalability is particularly useful for a company that is looking to expand globally and handle a large volume of data from various sources. * **Availability:** NoSQL databases are designed to be highly available, meaning that they can provide continuous service even in the event of hardware failures or network outages. This high availability is critical for a company that is looking to provide a global service with accommodation that can be booked at very short notice, as customers need to have access to real-time information about availability and booking. (Ease of access to all data about a single accommodation) * Better performance speed when handling simple queries * Extra data requirements that are not clear or consistent |
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1. The travel booking company collects personal data such as customer names and addresses. State and describe **two** data protection obligations that the company needs to comply with under the Personal Data Protection Act. [4]

| Any 2 of the following PDPA Obligations in the above context:  **1. Accountability Obligation**  Undertake measures to ensure that organisations meet their obligations under the PDPA such as making information about your data protection policies, practices and complaints process available upon request and designating a data protection officer (DPO) and making the business contact information available to the public.  **2. Notification Obligation**  Notify individuals of the purposes for which your organisation is intending to collect, use or disclose their personal data.  **3. Consent Obligation**  Only collect, use or disclose personal data for purposes which an individual has given his/her consent to.  Allow the individual to withdraw consent, with reasonable notice, and inform him/her of the likely consequences of withdrawal. Once consent is withdrawn, make sure that you cease to collect, use or disclose the individual’s personal data.  **4. Purpose Limitation Obligation**  Only collect, use or disclose personal data for the purposes that a reasonable person would consider appropriate under the given circumstances and for which the individual has given consent.  An organisation may not, as a condition of providing a product or service, require the individual to consent to the collection, use or disclosure of his or her personal data beyond what is reasonable to provide that product or service.  **5. Accuracy Obligation**  Make reasonable effort to ensure that the personal data collected is accurate and complete, especially if it is likely to be used to make a decision that affects the individual or to be disclosed to another organisation.  **6. Protection Obligation**  Reasonable security arrangements have to be made to protect the personal data in your organisation’s possession to prevent unauthorised access, collection, use, disclosure or similar risks.  **7. Retention Limitation Obligation**  Cease retention of personal data or dispose of it in a proper manner when it is no longer needed for any business or legal purpose.  **8. Transfer Limitation Obligation**  Transfer personal data to another country only according to the requirements prescribed under the regulations, to ensure that the standard of protection is comparable to the protection under the PDPA, unless exempted by the PDPC.  **9. Access and Correction Obligation**  Upon request, organisations have to provide individuals with access to their personal data as well as information about how the data was used or disclosed within a year before the request.  Organisations are also required to correct any error or omission in an individual’s personal data as soon as practicable and send the corrected data to other organisations to which the personal data was disclosed (or to selected organisations that the individual has consented to), within a year before the correction is made.  **10. Data Breach Notification Obligation**  In the event of a data breach, organisations must take steps to assess if it is notifiable. If the data breach likely results in significant harm to individuals, and/or are of significant scale, organisations are required to notify the PDPC and the affected individuals as soon as practicable.  **11. Data Portability Obligation**  At the request of the individual, organisations are required to transmit the individual’s data that is in the organisation’s possession or under its control, to another organisation in a commonly used machine-readable format. |
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1. An educational institution wants to ensure that its data is protected and preserved for the long-term using data backup and archive. Explain the main difference between data backup and archive. Provide an example of how each could be used in the context of the institution's operations. [3]

| Data backup is the process of making copies of data to protect against data loss in the event of hardware failure, data corruption, accidental deletion, or other disasters. A backup is typically a short-term solution and may be performed on a regular basis (e.g., daily, weekly) to ensure that data is up to date and readily available in case of a data loss event. Archive, on the other hand, is the process of moving data that is no longer in active use to a separate, long-term storage location for preservation purposes. Archives may be used to retain data for compliance, legal, or historical purposes, and may be stored for much longer periods of time than backups. [1]  Any reasonable answer in the context of the question.  For example, an educational institution may perform regular backups of its student information system, including grades, attendance records, and transcripts, to ensure that this critical data is protected in the event of a system failure. [1]  Any reasonable answer in the context of the question.  For example, an educational institution may archive records of student enrolment from previous academic years for compliance with regulations and to maintain historical records of enrolment trends. [1] |
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1. The Infocomm Media Development Authority (IMDA) and Singapore Computer Society (SCS) have jointly developed a Code of Conduct for Computing Professionals in Singapore. The code outlines the expected standards of behaviour and professional ethics for individuals working in the computing industry in Singapore.

Your system solutions company is approached by a school to develop facial recognition software to monitor the attendance of students, which would require collecting biometric data from the students without their explicit consent.

Provide **two** examples to explain how you will uphold the Code of Conduct for Computing Professionals in this scenario. [2]

| In this scenario, collecting biometric data from students without their explicit consent would likely be in violation of the SCS code of conduct, which emphasises the importance of respecting individuals' privacy and autonomy, adhering to ethical principles and standards as well as exercising social responsibility.  Any reasonable answer in the context of the question.  To uphold the SCS code of conduct, the system solutions company could take several steps:  **Educate the school:** The company could work with the school to explain the ethical implications of using facial recognition technology to monitor students' attendance, and help them understand the potential risks and benefits of this approach.  **Obtain informed consent:** The company could work with the school to obtain informed consent from the students and their parents or guardians, explaining the purpose of the technology, how their data will be collected, stored, and used, and any potential risks and benefits associated with this.  **Minimise data collection:** The company could work with the school to minimise the amount of biometric data collected from students and ensure that any data collected is stored securely and used only for the intended purpose.  **Regularly review and update the system:** The company could work with the school to regularly review and update the facial recognition system to ensure it is functioning as intended and that any potential risks are mitigated. |
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**End of Paper**

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