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**PROTEA HEIGTHS ACADEMY**

**GRADE 12**

**INFORMATION TECHNOLOGY P2**

**THEORY EXAMINATION**

**SEPTEMBER 2024**

**MARKS: 150**

**TIME: 3 HOURS**

**This question paper consists of 14 pages including the cover page.**

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| INSTRUCTIONS AND INFORMATION |  |  |

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| --- | --- | --- | --- |
| 1. | This question paper consists of SIX sections: |  |  |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | SECTION A:  SECTION B:  SECTION C:  SECTION D:  SECTION E:  SECTION F: | Short Questions (20)  Systems Technologies (20)  Communication and Network Technologies (20)  Data and Information Management (30)  Solution Development (20)  Integrated Scenario (40) |  |  |

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| --- | --- | --- | --- |
| 2. | Read ALL the questions carefully. |  |  |

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| 3. | Answer ALL the questions. |  |  |

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| 4. | The mark allocation generally gives an indication of the number of facts/reasons required. |  |  |

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| 5. | Number the answers correctly according to the numbering system used in this question paper. |  |  |

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| 6. | Write neatly and legibly. |  |  |

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| SECTION A: SHORT QUESTIONS |  |  |

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| QUESTION 1 |  |  |

**QUESTION 1.1: MULTIPLE CHOICE QUESTIONS**

Various options are provided as possible answers to the following questions. Choose the most correct answer and write only the letter (A-D) CLEARLY next to the question number (1.1.1-1.1.5)

**Example: 1.1.11 D**

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| --- | --- | --- | --- | --- |
| 1.1 | 1.1.1 | What is the primary difference between RAM and ROM? |  |  |

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|  |  | A | RAM is volatile, ROM is non-volatile |  |  |
|  |  | B | RAM stores data permanently, ROM stores data temporarily |  |  |
|  |  | C | RAM is used for processing, ROM is used for storage |  |  |
|  |  | D | RAM is read-only, ROM is read/write |  | (1) |

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|  | 1.1.2 | Which of the following is not an example of a biometric input device? |  |  |

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| --- | --- | --- | --- | --- | --- |
|  |  | A | Fingerprint scanner |  |  |
|  |  | B | Retina scanner |  |  |
|  |  | C | Keyboard |  |  |
|  |  | D | Facial recognition system |  | (1) |

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|  | 1.1.3 | What is the main purpose of a cache memory? |  |  |

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|  |  | A | Stores frequently used instructions and data |  |  |
|  |  | B | Acts as a backup for RAM |  |  |
|  |  | C | Increases storage capacity |  |  |
|  |  | D | Manages network traffic |  | (1) |

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|  | 1.1.4 | Which of the following is not a feature of cloud computing? |  |  |

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|  |  | A | On-demand self-service |  |  |
|  |  | B | Broad network access |  |  |
|  |  | C | Resource pooling |  |  |
|  |  | D | Physical isolation |  | (1) |

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|  | 1.1.5 | What is the main difference between shareware and freeware? |  |  |

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|  |  | A | Shareware requires payment after a trial period, freeware is always free |  |  |
|  |  | B | Shareware is open source, freeware is proprietary |  |  |
|  |  | C | Shareware is for businesses, freeware is for personal use |  |  |
|  |  | D | Shareware has limited functionality, freeware has limited functionality |  | (1) |

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|  | 1.1.6 | What is the primary purpose of RAID (Redundant Array of Independent Disks)? |  |  |

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|  |  | A | Increase data storage capacity |  |  |
|  |  | B | Improve data redundancy and performance |  |  |
|  |  | C | Enhance data encryption |  |  |
|  |  | D | Protect data of Secure data in event of hardware failure |  | (1) |

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|  | 1.1.7 | Which of the following is a non-volatile storage device? |  |  |

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|  |  | A | RAM |  |  |
|  |  | B | SSD |  |  |
|  |  | C | Cache |  |  |
|  |  | D | Registers |  | (1) |

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|  | 1.1.8 | Which technology is primarily used for connecting devices over short distances without cables? |  |  |

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| --- | --- | --- | --- | --- | --- |
|  |  | A | Wi-Fi |  |  |
|  |  | B | Bluetooth |  |  |
|  |  | C | Ethernet |  |  |
|  |  | D | Fiber optic |  | (1) |

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|  | 1.1.9 | What is the main function of a DNS (Domain Name System) in networking? |  |  |

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|  |  | A | Assigning IP addresses to devices |  |  |
|  |  | B | Translating domain names to IP addresses |  |  |
|  |  | C | Routing data packets between devices |  |  |
|  |  | D | Encrypting network communications |  | (1) |

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|  | 1.1.10 | Which of the following best describes a device driver? |  |  |

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|  |  | A | A hardware component that manages data processing in a computer. |  |  |
|  |  | B | A type of software that allows the operating system to communicate with hardware. |  |  |
|  |  | C | An application that provides user access to specific computer programs. |  |  |
|  |  | D | A protocol used for network communication between computers. |  | (1) |

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| 1.2 | Give ONE word/term for each of the following descriptions. Write only the word/term next to the question number (1.2.1–1.2.10) in the ANSWER BOOK. |  |  |

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|  | 1.2.1 | A participant in a peer-to-peer (P2P) file-sharing network who has a complete copy of a file and actively shares it with others. |  | (1) |
|  |  |  |  |  |
|  | 1.2.2 | A lightweight computing device that relies on a central server for processing and storage, rather than performing these tasks locally. |  | (1) |
|  |  |  |  |  |
|  | 1.2.3 | A program that translates high-level programming language into machine code. |  | (1) |
|  |  |  |  |  |
|  | 1.2.4 | A set of rules that define how data is transmitted and received over a network. |  | (1) |
|  |  |  |  |  |
|  | 1.2.5 | The smallest unit of data in a computer. |  | (1) |

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| 1.3 | Indicate whether the following statements are TRUE or FALSE. Write 'true' or 'false' next to the question numbers (1.3.1 to1.3.5) in the ANSWER BOOK. If the statement is true, write 'TRUE'. If the statement is false, write 'FALSE' and change the underlined word(s) to make the statement TRUE. (Do NOT simply use the word 'NOT' to change the statement.) NO mark will be awarded if FALSE is written without a correct answer. |  |  |

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|  | 1.3.1 | An SSD (Solid State Drive) is slower than an HDD (Hard Disk Drive) when accessing data. |  | (1) |
|  |  |  |  |  |
|  | 1.3.2 | The HTTP protocol is used for securing data transmission over the Internet. |  | (1) |
|  |  |  |  |  |
|  | 1.3.3 | Data that is compressed and moved to an external storage device is called a backup. |  | (1) |
|  |  |  |  |  |
|  | 1.3.4 | Open-source software allows users to modify and distribute the software freely. |  | (1) |
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|  | 1.3.5 | In a relational database, a table row is also known as a record. |  | (1) |

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| TOTAL SECTION A: |  | **20** |

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| SECTION B: SYSTEMS TECHNOLOGIES |  |  |

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| QUESTION 2 |  |  |

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| **SCENARIO**  You are a systems administrator at a small startup company, TechNova, which focuses on developing innovative software solutions for various industries. The company has 10 employees working on-site and remotely. TechNova support various Universities.  TechNova's Computer Specifications:  Workstations: Intel i7 CPU, 16GB RAM, 512GB SSD, Windows 10  Server: Intel Xeon CPU, 32GB RAM, 1TB SSD, Ubuntu Server 20.04  Network: 1 Router, 1 Switch, 5 PCs, 1 Printer  Software: Microsoft Office 365, Adobe Creative Cloud, Visual Studio, PostgreSQL, Docker |  |  |

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| 2.1 | The workstation of company has Windows 10 listed as the operation system. |  |  |

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|  | 2.1.1 | List TWO functions of an operating system. |  | (2) |
|  |  |  |  |  |
|  | 2.1.2 | State a different type of operating system that is freeware. |  | (1) |
|  |  |  |  |  |
|  | 2.1.3 | Justify why proprietary software, like Windows 10, is more commonly used than FOSS operating systems. |  | (2) |

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| 2.2 | The server has '32 GB RAM' listed as a specification. |  |  |

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|  | 2.2.1 | Explain the purpose of RAM in a computer system. |  | (2) |
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|  | 2.2.2 | Describe why a server would have more RAM than a workstation. |  | (2) |
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|  | 2.2.3 | Critically discuss the amount of storage available on the server. |  | (3) |

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| 2.3 | TechNova suggested that universities make use of cloud-based servers that could be used for the administration department. | |  |
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|  | 2.3.1 | Briefly explain what a cloud-based virtual server is. | (2) |
|  |  |  |  |
|  | 2.3.2 | Justify the use of cloud-based virtual servers. | (2) |
|  |  |  |  |
|  | 2.3.3 | Software as a Service (SaaS) is currently used on the computers in the administration building.  Except for the benefit of renting instead of buying software, state TWO other benefits of using SaaS. | (2) |

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| 2.4 | The university prints many hard copies every day. | |  |
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|  | 2.4.1 | If a USB port fails, which other technology can be used to connect a printer to a laptop? | (1) |
|  |  |  |  |
|  | 2.4.2 | Many documents at the university are still only available as hard copies, but still need to be scanned and edited on a computer.  Which type of software would you suggest they use for this purpose? | (1) |

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| TOTAL SECTION B: | **20** |

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| **SECTION C: COMMUNICATION AND NETWORK TECHNOLOGIES** |  |  |

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| QUESTION 3 |  |  |

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| At Nexus Institute, students are tasked with designing and implementing a secure network system for an institution, where they must protect sensitive customer data from potential cyber threats. |  |  |

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| 3.1 | Networks are fundamental to communication. |  |  |

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|  | 3.1.1 | Identify and motivate the need for at least TWO components used in a LAN. |  | (4) |

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|  | 3.1.2 | List TWO technologies that use radio waves to transfer data. |  | (2) |

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| 3.2 | The company distributes their software using BitTorrent. |  |  |

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|  | 3.2.1 | Explain what BitTorrent is. |  | (2) |

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|  | 3.2.2 | Is it illegal for the company to make use of BitTorrent? Motivate your answer. |  | (2) |

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| 3.3 | Employees of the company must be able to access the secure network from remote locations. |  |  |

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|  | 3.3.1 | Give an example of a third-party program that can be used for remote desktop access. |  | (1) |
|  |  |  |  |  |
|  | 3.3.2 | Justify in which circumstance would a person rather make use of remote access instead of a VPN? |  | (2) |

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| 3.4 | The school would like to incorporate VoIP technology in the offices. |  |  |

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|  | 3.4.1 | Write out the acronym VoIP. |  | (1) |
|  |  |  |  |  |
|  | 3.4.2 | How does VoIP differ from traditional telephone calls? |  | (2) |
|  |  |  |  |  |
|  | 3.4.3 | Assess the possible technical challenges that might be faced when using VoIP at the company. Discuss at least TWO challenges. |  | (4) |

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| TOTAL SECTION C: |  | **20** |

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| SECTION D: DATA AND INFORMATION MANAGEMENT |  |  |

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| QUESTION 4 |  |  |

A small, local business has decided to take their business online with the use of an e-Commerce website. Potential clients will be able to use the website to order stocked goods online.

The webserver of the above-mentioned site will be connected to a database with the following design and structure:

A screenshot of a computer screen

Description automatically generated

This design is severely problematic. Answer the questions below to identify the possible issues and suggest a better solution:

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| 4.1 | Identify the possible anomaly in **tblStock** and describe how this anomaly will occur. |  | (3) |

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| 4.2 | The current design only allows for a single client to order a single stock item. |  |  |

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|  | 4.2.1 | Draw an ERD (Entity Relationship Diagram) to describe a better relationship between the multiple clients who can order multiple items of stock. |  | (5) |
|  |  |  |  |  |
|  | 4.2.2 | The issue is easily corrected using a third table (**tblOrders)**.  Suggest at least 3 compulsory fields for this table. |  | (3) |

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| 4.3 | Explain why it would be problematic to sort the table **tblClients** on the clients surname. |  | (2) |

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| 4.4 | The business has expressed their concerns regarding the logical integrity of the data in the database. Explain at least TWO ways of ensuring logical integrity. |  | (2) |

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| 4.5 | The database manager has raised concerns regarding the future development of the database.  Explain how you will account for this by referring to physical and logical independence. |  | (4) |

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| 4.6 | Should the database later contain sensitive client information like credit card details, contact information or accounts – how could you ensure that the data in the database is kept safe?  Name and briefly explain THREE methods. |  | (6) |

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| 4.7 | The developer has designed a web-interface that allows the user to search for products. The content of the search bar is copied directly into an SQL statement and returned to the webpage dynamically.  While this works perfectly – explain to the web developer why this is a very bad idea. |  | (3) |

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| 4.8 | Local power cuts have left servers vulnerable to hardware failure.  Identify and describe a method that could ensure the ‘UP-TIME’ of the website. |  | (2) |

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| **TOTAL SECTION D:** |  | **30** |

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| SECTION E: SOLUTION DEVELOPMENT |  |  |

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| **QUESTION 5** |  |  |

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| 5.1 | The backend developers are experiencing some difficulty in debugging the source code. Answer the following questions to assist them: | | |  |
|  |  | | |  |
|  | 5.1.1 | For each of the following statements, the variable **x** will receive a random value. Write down the smallest possible value and the largest possible value of **x** to indicate the range of numbers possible. E.g., 1-10 | |  |
|  |  |  | |  |
|  |  | (a) | x := Random(10); | (2) |
|  |  |  |  |  |
|  |  | (b) | x := Random(99) + 7; | (2) |
|  |  |  |  |  |
|  |  | (c) | x := 1 \* (Random(101)/100); | (2) |
|  |  |  | |  |
|  | 5.1.2 | Review the code snippet below and answer the questions that follow:  1 **var**  2 arrNums: Array[1..10] of Integer;  3 i, iTemp : Integer;  4 bSorted : Boolean;  5 **begin**  6 for i := 1 to 10 do 7   arrNums[i] := random(100);  8 bSorted := false;  9 while **not** bSorted do  10 **begin**  11 bSorted := true;  12 for i := 1 to 10 do  13 **begin**  14 if arrNums[i] < arrNums[i+1] then  15 **begin**  16 bSorted := false;  17 iTemp := arrNums[i];  18 arrNums[i] := arrNums[i+1];  19 arrNums[i+1] := iTemp;  20 **end;**  21  **end;**  22 **end;** | |  |
|  |  |  | |  |
|  |  | (a) | What do you think the intended purpose of the code was? | (2) |
|  |  |  |  |  |
|  |  | (b) | The code above will produce an error. Predict the error and indicate how the code can be modified to prevent the error. | (3) |
|  |  |  |  |  |
|  |  | (c) | What is the purpose of the boolean variable in the code? | (1) |
|  |  |  |  |  |
|  |  | (d) | In line 17-19 the values of the array are swopped. Could the same not be achieved by the code below? Motivate your answer. |  |
|  |  |  |  |  |
|  |  |  | arrNums[i] := arrNums[i+1];  arrNums[i+1] := arrNums[i]; | (3) |
| 5.2 | Look at the UML class diagram below and answer the following questions:   |  | | --- | | **TStockItem** | | - fStockId : string;  - fPrice : double  - fQuantity : Integer;  - fDescription : string; | | + <constructor> Create();  + getPrice: double  + sale(quantity : integer);  + restock(amount: integer);  + setPrice(amount: Double); | | | |  |
|  |  |  | |  |
|  | 5.2.1 | What is the purpose of the **–** and **+** in the diagram? | | (2) |
|  |  |  | |  |
|  | 5.2.2 | Identify one assessor method. | | (1) |
|  |  |  | |  |
|  | 5.2.3 | Identify one mutator method. | | (1) |
|  |  |  | |  |
|  | 5.2.4 | Write down ONE reason why Object Orientated Programming is necessary for modern computer programming. | | (1) |

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| **TOTAL SECTION E:** | **20** |

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| SECTION F: Integrated scenario |  |  |

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| QUESTION 6 |  |  |

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| TechWave Solutions is a dynamic web development company specialising in creating innovative and user-friendly websites for small businesses. Recently, they undertook a project to redesign the website for a local health and fitness centre, incorporating e-commerce features and an interactive booking system. |  |  |

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| 6.1 | The company is investigating all the possible technologies to use to create the website for the fitness centre. |  |  |

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|  | 6.1.1 | What is HTML and what is it used for? |  | (2) |

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|  | 6.1.2 | Explain what CSS (Cascading Style Sheets) is. |  | (2) |

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|  | 6.1.3 | State TWO advantages of using CSS. |  | (2) |

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|  | 6.1.4 | Most dynamic, interactive web pages still need all data and elements to be downloaded at once to the browser. |  |  |

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|  |  | (a) | Provide TWO problems associated with a single web page for which all data and elements need to be downloaded at once to the browser. |  | (2) |
|  |  |  |  |  |  |
|  |  | (b) | Give the name of the technology that gets around the problems highlighted in the previous question (6.1.4 (a)) and briefly describe how it gets around these problems. |  | (3) |

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| 6.2 | The internet provides users with plentiful resources. |  |  |

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|  | 6.2.1 | Explain the difference between the internet and the WWW. |  | (2) |

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|  | 6.2.2 | What is the purpose of a search engine? |  | (1) |

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|  | 6.2.3 | Suggest why a web browser cannot be effectively used to find information on the Internet or Web. |  | (2) |

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| 6.3 | The web has evolved over the past few years and is still continually evolving. |  |  |

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|  | 6.3.1 | Explain what a *customised* or *profiled search* is by referring to how a company like *Google* would be able to conduct such a search. |  | (3) |

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|  | 6.3.2 | *Mediated* or *curated* searches can follow two main models for generating their content and even sometimes combine these two models to try to get the best of both worlds.  Briefly outline how these two different methods work. |  | (2) |

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|  | 6.3.3 | The company need a huge amount of processing power to host all the websites for their clients. |  |  |

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|  |  | (a) | Define distributed computing. |  | (2) |
|  |  |  |  |  |  |
|  |  | (b) | Provide TWO advantages of utilising distributed computing. |  | (2) |

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| 6.4 | Users on a network is susceptible to attacks from social engineers. | |  |  |
|  |  |  |  |  |
|  | 6.4.1 | Define the term *social engineer*. |  | (2) |
|  |  |  |  |  |
|  | 6.4.2 | Explain how Phishing works. |  | (2) |
|  |  |  |  |  |
|  | 6.4.3 | List TWO methods how a user can protect themselves from social engineering. |  | (2) |

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| 6.5 | There is a lot of discussion around the Metaverse and its many possible applications. | |  |  |
|  |  |  |  |  |
|  | 6.4.1 | Briefly explain what the Metaverse is. |  | (2) |
|  |  |  |  |  |
|  | 6.4.2 | Name TWO hardware component needed to use the Metaverse effectively. |  | (2) |

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| 6.5 | There are many computer-related crimes and dangers that exist and are a cause of concern for the company. | |  |  |
|  |  |  |  |  |
|  | 6.4.1 | A DDoS attack is one of the many dangers that the company is concerned about.  Explain what a DDoS attack is. |  | (2) |
|  |  |  |  |  |
|  | 6.4.2 | Explain what a Botnet is and how they can be used in a DDoS attack. |  | (3) |

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| TOTAL SECTION F:GRAND TOTAL: |  | **40**  **150** |