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MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**ADVANCED MATRICULATION LEVEL
2024 FIRST SESSION**

SUBJECT:	**Information Technology**
PAPER NUMBER:	I
DATE:	21st May 2024
TIME:	9:00 a.m. to 12:05 p.m.

Directions to candidates

A total of **SIX** questions must be attempted; **THREE** from Section A and another **THREE** from Section B.

SECTION A: INFORMATION SYSTEMS

Answer the first question and any other TWO questions in this section.

Question A1

This question is compulsory. Answer all parts.

A medium-sized manufacturing company, XYZ Manufacturing, is facing challenges in managing its information effectively. The company produces various components for the automotive industry and has multiple departments responsible for different aspects of the manufacturing process. The management is keen on leveraging information systems to enhance operational efficiency, decision-making, and overall organisational performance.

a) Define information systems and explain their significance in organisational contexts. (2)

b) Discuss **THREE** key issues that organisations like XYZ Manufacturing might face concerning the effective use of information systems. (3)

c) Describe data processing systems, knowledge work systems, and management information systems. (3)

d) Provide examples of how **each** type of system mentioned in part c) could be implemented within XYZ Manufacturing to address specific business needs. (3)

e) Differentiate between internal and external information concerning an organisation. (2)

f) Provide **ONE** example of internal and **ONE** example of external information which might be received by XYZ Manufacturing. (2)

g) Differentiate between strategic, tactical, and operational information systems. (3)

h) Choose the most suitable type of information system for XYZ manufacturing. Give a justification for your reasoning. (2)

(Total: 20 marks)

Please turn the page.

Answer TWO questions from Questions A2, A3 and A4.

Question A2

ABC Corporation, a global retail corporation, wants to improve its decision-making processes and overall efficiency through the implementation of advanced information systems. The Chief Information Officer (CIO) of ABC Corporation, is considering the introduction of Management Information Systems (MIS), Executive Information System (EIS) and Online Analytical Processing (OLAP).

a) Explain the role of MIS in organisations, particularly within ABC Corporation. (2)

b) Identify and discuss **FOUR** key characteristics of a Management Information System. (4)

c) Outline **FOUR** factors that could influence the success or failure of implementing MIS at ABC Corporation. (4)

d) Define the term 'data warehousing' and explain how ABC Corporation could benefit in managing its vast retail data with the implementation of a data warehouse. (2)

e) Define EIS and state how it differs from MIS. (2)

f) The EIS wanted by the CIO of ABC Corporation has drill-down capabilities. Explain the purpose of such techniques within EIS. (2)

g) Explain the concept of OLAP and discuss its relevance in the context of ABC Corporation. (2)

h) Provide **TWO** examples of how OLAP could be applied to retail data analysis for strategic decision-making. (2)

(Total: 20 marks)

Question A3

In a secondary school IT class, the teacher explained the workings of microprocessors, RAM, and ROM and character encoding. Using simple explanations and engaging examples, the teacher managed to explain to the class an understanding of these fundamental components.

a) Define a microprocessor and explain its role in computing devices. (2)

b) Draw the outline of a microprocessor that the teacher might have used during the lesson. Your answer should include a minimum of **FOUR** major components. (4)

c) Identify what transfers data within different components of the microprocessor. (1)

d) Describe what is RAM. (1)

e) Discuss the **TWO** main types of RAM currently in use, emphasising their characteristics and applications. (3)

f) Describe what is ROM. (1)

g) Discuss **TWO** main types of ROM currently in use, highlighting their differences and typical use cases. (3)

h) Mention **TWO** types of character representation/encoding systems. (1)

i) Explain **each** character representation/encoding systems specified in part (h). (2)

j) Provide **TWO** advantages of one character representation system specified in part (h) over the other. (2)

(Total: 20 marks)

Question A4

DataGuard Solutions, a leading data management company, specialises in safeguarding critical information for various businesses. The IT manager at DataGuard, is responsible for implementing robust backup strategies to ensure data integrity and availability for all clients.

a) Explain the concept of a full backup strategy. (1)

b) Mention **TWO** advantages and **TWO** disadvantages of a full backup strategy. (4)

c) Define an incremental backup strategy. (1)

d) Mention **TWO** advantages and **TWO** disadvantages of an incremental backup strategy. (4)

e) Describe the standard data backup procedure which might have been used by DataGuard. Make sure to include at least **FOUR** steps. (4)

f) Explain the functionality of a RAID system in the context of data backup and explain how this might be beneficial for DataGuard. (2)

g) Differentiate between onsite and offsite backups. (2)

h) Discuss which backup type, whether onsite or offsite, would be more suitable for ensuring data resilience at DataGuard. Explain your reasoning. (2)

(Total: 20 marks)

Please turn the page.

SECTION B: Human Communication and Business Organisation

Answer the first question and any other TWO questions in this section.

Question B1

This question is compulsory. Answer all parts.

'GreenHarvest Farms' is an organic farming company that specialises in sustainable agriculture. The company has recently expanded its operations and workforce to meet the growing demand for organic produce. Thus effective upward and downward communication structures must be established to distribute information.

a) Explain the role of a knowledge base, in distributing information within a technology company. (2)

b) Discuss **THREE** advantages of using collaboration tools for real-time information sharing among employees. (3)

c) Describe an upward communication structure. (1)

d) Provide **TWO** examples of upward communication which might occur in 'GreenHarvest Farms'. (2)

e) Describe a downward communication structure. (1)

f) Give **TWO** examples of downward communication which might be used by 'GreenHarvest Farms'. (2)

g) Provide a definition for lateral communication and grapevine communication within this agricultural organisation. (2)

h) Describe how lateral communication can enhance collaboration between different departments. Provide at least **TWO** reasons. (2)

(Total: 15 marks)

Answer any TWO questions from B2, B3 and B4.

Question B2

VFG is a startup specialising in sustainable products. The company is preparing to launch a new line of eco-friendly products and wants to communicate its commitment to environmental responsibility effectively. Visual communication strategies and related technologies are used to convey the company's values and product features to various stakeholders.

a) Explain visual communication. (1)

b) List **FOUR** examples of visual communication which might be used by VFG. (2)

c) Describe **TWO** other types of communication which the company might have used to convey the company's product. (2)

d) Mention **TWO** technologies related to **each** communication mentioned in part c). (4)

e) Mention **TWO** technologies which are usually related to visual communication which VFG might make use of. (2)

f) Provide **ONE** advantage for **each** of the technologies mentioned in part e). (4)

(Total: 15 marks)

Question B3

Malta has a mixed economy with both private enterprises and public sector entities contributing to its economic environment. This blend allows for a diverse range of businesses, each playing a unique role in the country's economic development.

a) Explain the concept of a mixed economy. (1)

b) Discuss **TWO** advantages and **TWO** disadvantages of a mixed economic system, considering the local business environment. (4)

c) Mention **FOUR** types of organisations which are present in Malta. (2)

d) List **ONE** advantage and **ONE** disadvantage for **each** type of organisation mentioned in part (c). (8)

(Total: 15 marks)

Question B4

The local community centre wants to enhance its operations with the help of basic data and information practices. Employees at the community centre rely on simple data inputs and use gathered information to make informed decisions for the benefit of the community.

a) Differentiate between 'data' and 'information'. (2)

b) Discuss the importance of data and information to the local community centre. (1)

c) Explain, in simple terms, the input-process-output cycle and how it contributes to managing events and memberships at the community centre. (2)

d) Differentiate between 'direct' and 'indirect' sources of data. (2)

e) Provide **TWO** examples of direct sources of data which might be used by the local community centre and **TWO** examples of indirect sources of data. (4)

f) Discuss **THREE** challenges of dealing with too much information in a community centre setting. (3)

g) What is the term used to refer to the concept mentioned in part f)? (1)

(Total: 15 marks)

SUBJECT:	**Information Technology**
PAPER NUMBER:	II
DATE:	21st May 2024
TIME:	4:00 p.m. to 7:05 p.m.

Directions to candidates

A total of **SIX** questions must be attempted; **THREE** from Section A and another **THREE** from Section B.

SECTION A: SOFTWARE

Answer the first question and any other TWO questions in this section.

Question A1

This is a compulsory question. Answer all parts.

The following is a very basic personal website.

```
1.   <!DOCTYPE html>
2.   <html lang="en">
3.   <head>
4.       <meta charset="UTF-8">
5.       <meta name="viewport" content="width=device-width, initial-scale=1.0">
6.       <title>My Web Page</title>
7.       <style>
8.          body {
9.              font-family: 'Arial', sans-serif;
10.             background-color: #f0f0f0;
11.             margin: 20px;
12.          }
13.          h1{
14.              color: #333;
15.          }
16.          .content {
17.             padding: 10px;
18.             background-color: #fff;
19.             border: 1px solid #ddd;
20.          }
21.       </style>
22.  </head>
23.  <body>
24.     <div class="content">
25.         <h1>Welcome to My Web Page!</h1>
26.         <p>This is a sample web page for testing.</p>
27.         <img  src="myself.jpg"  alt="Picture  of  Myself"  width="300"
     height="200">
28.         <p>My Hobbies</p>
29.         <ul>
30.            <li>Soccer</li>
31.            <li>Food</li>
32.            <li>Sports</li>
33.         </ul>
34.     </div>
35.  </body>
36.  </html>
```

a) Explain the purpose of the following HTML elements in the code:
   i.   `<html>`; (1)
   ii.   `<body>`; (1)
   iii. `<div>`; (1)
   iv. `<style>`. (1)

b) Explain the purpose of the alt attribute in the `<img>` tag, and why it is important for accessibility. (2)

c) Inside the .content div, below the existing unordered list (`<ul>`), add **TWO** more items to the list with the text "Reading" and "Travel." (2)

d) Create a new paragraph inside the .content div with the text "Favorite Books" and below it, add an ordered list with at least **THREE** book titles as list items. (4)

e) Modify the provided HTML code to include an external CSS file. Create a new file named "**styles.css**" and move the existing CSS rules from the HTML file to the external CSS file. Ensure that the HTML file correctly links to the external CSS file. (3)

(Total: 15 marks)

Answer any TWO questions from Questions A2, A3 and A4.

Question A2

Software is a set of instructions or programs that enable a computer to perform specific tasks or functions.

a) Briefly explain **THREE** types of utility programs in System Software. (3)

b) Explain how the OS serves as a platform for other system software components. (2)

c) Explain the purpose of the kernel in an Operating System (OS). (2)

d) Describe the significance of Object Linking and Embedding (OLE) in software capabilities. (1)

e) A new application package is being evaluated. Provide **THREE** criteria that should be included in the evaluation report and explain their significance. (3)

f) Differentiate between the following types of OS.
   i.   Single program OS. (1)
   ii.   Multitasking. (1)
   iii. Multiprogramming. (1)
   iv. Networked. (1)

(Total: 15 marks)

Question A3

Databases are organised collections of structured information that enable efficient storage, retrieval, and management of data, facilitating seamless access and manipulation for various applications.

a) Mention **TWO** limitations of a flat-file approach in traditional file-based systems. (2)

b) List **THREE** advantages of Relational Database Systems over traditional filing systems. (3)

c) Define the following terms in the context of the relational data model:
   i.   Entity; (1)
   ii.   Field (attribute); (1)
   iii. Record (tuple). (1)

d) Discuss **THREE** types of field that can be used in relational tables and provide examples of each. (3)

e) Discuss the three-level schema in a DBMS. (4)

(Total: 15 marks)

Question A4

The following questions delve into the conceptual understanding and real-world applications of Internet development, protocols, client applications, and security.

a) Define and explain the purpose of the following Internet protocols:
   i.   SMTP; (1)
   ii.   POP; (1)
   iii.   IMAP; (1)
   iv.   FTP; (1)
   v.   HTTP; (1)
   vi.   TCP/IP. (1)

b) Explain how the collaborative nature of the Internet's development contributed to innovation. Provide examples of inventions or technologies that emerged as a result of this collaborative spirit. (3)

c) Analyse the role of mobile phones in expanding Internet access. Discuss how mobile connectivity has influenced societal behaviors, economic activities, and information access, considering both developed and developing regions. (3)

d) Evaluate the limitations of traditional solutions like firewalls and antivirus software in addressing evolving cyber security threats. Discuss the need for holistic approaches and ongoing vigilance in the face of emerging challenges. (3)

(Total: 15 marks)

Please turn the page.

SECTION B: PROGRAMMING TECHNIQUES AND SYSTEM DEVELOPMENT

Answer the first question and any other TWO questions in this section.

Question B1

This is a compulsory question. Answer all parts.

a) The following code snippet in Java programming will display three countries and according to the user's choice, it will display the capital city.

```
1. import java.util.Scanner;
2. class CaptialCity {
3.     public static void main (String args[]) {
4.         Scanner input = Scanner new(System.in);
5.
6.         int choice;
7.         System.out.println ("Capital of which country?\n");
8.         System.out.println ("Press 1 for Malta");
9.         System.out.println ("Press 2 for Italy");
10.        System.out.println ("Press 3 for England\n");
11.        System.out.print ("Type your choice: ");
12.        choice = in.nextInt();
13.
14.        if (choice = 1) {
15.            System.out.println ("\nValletta");
16.        } else if (choice = 2)
17.            System.out.println ("\nRome");
18.          else if (choice = 3){
19.            System.out.println ("\nLondon");
20.        } else {
21.            System.out.println ("\nIncorrect Key");
22.        }//end of if
23.     }
24. }
```

i.   The code snippet above contains five syntax errors. Identify the errors and write down the correct syntax. (5)

ii. Modify the code to include an additional choice, numbered *4 for Gozo*, which if chosen would output *Victoria*. Clearly mark at which lines you are inserting your code. (4)

iii. Mention another type of conditional branching that could be used instead of the IF statement. (1)

b) Create the HTML code needed that enables users to send an email by clicking on a link, which should have a blue color. (5)

c) Structured Query Language (SQL) is a programming language designed for managing and manipulating data in a relational database.

```
SELECT email FROM users;
```

i.   Explain the function of the above query code. (1)

ii. Modify the above code to select **all** fields in the table users. (1)

iii. Modify the above code to order the results in desceding order according to the *userID* field. (3)

(Total: 20 marks)

Answer any TWO questions from Questions B2, B3 and B4.

Question B2

Foundations of Programming refers to the fundamental principles, concepts, and skills that serve as the building blocks for understanding and practicing computer programming.

a) Analyse the following real life scenarios and answer the questions.
   i.   During a coding competition, a participant mistakenly uses a reserved word as a variable name. Describe the consequences of such an error and provide examples of reserved words. (2)
   ii. A software project involves mathematical calculations that require fixed values. Describe the significance of constants in ensuring accuracy and stability, giving examples. (2)
   iii. While designing a payroll system, you realise the need for modular code. Discuss the importance of subroutines (methods) in this system, providing examples. (2)
   iv. You are developing a data analysis tool that requires storing and processing large datasets. Discuss the significance of one and two-dimensional arrays in this context, providing examples. (2)
   v.   You are designing a program that involves tracking the temperature fluctuations throughout the day. Explain how variables play a role in this program and provide examples. (2)

b) Syntax refers to the correct structure and grammar of code; logical pertains to the reasoning and flow of code; runtime involves errors occurring while executing the program.
   i.   Identify the type of error and correct any issues with the following code snippet on reserved words. (2)
```
1. int 1variable = 10;
2. String name = "Doctor Who";
3. Boolean isTrue = true;
```

   ii. Identify the type of error and correct any issues with the following code snippet on parameter passing. (3)
```
1. void printDetails(int rollNumber, String name) {
2.    System.out.println("Roll Number: " + rollNum);
3.    System.out.println("Name: " + name); }
4. printDetails(101, John);
```

   iii. Identify the type of error and correct any issues with the following code snippet on control structures. (2)
```
1. int sum = 0;
2. for (int i = 1; i <= 10; i--) {
3.    sum += i;
4. }
```

   iv. Identify the type of error and correct any issues with the following code snippet on arrays and control structures. (3)
```
1. int[] numbers = {1, 2, 3, 4, 5};
2. int i = 0;
3. while (i <= 5) {
4.    System.out.println(numbers[i]);
5.    i++;
6. }
```

(Total: 20 marks)

Please turn the page.

Question B3

BrightIdeas Marketing Solutions is a medium-sized marketing agency. Within the past few months, a noticeable decline in project completion rates and client satisfaction has been observed. The management suspects that there might be underlying issues affecting the team's performance and the quality of deliverables. To address this situation, the company has decided to conduct a thorough analysis, focusing on problem identification and investigation.

a) Provide **TWO** examples of common indicators that might signal a problem in a business or project context. (2)

b) Provide **TWO** ideas on how you might structure interview questions to gather insights into the perspectives of team members or stakeholders. (2)

c) Mention **ONE** scenario where questionnaires would be a suitable method for collecting data, and **ONE** scenario where challenges might arise in their use. (2)

d) Mention **TWO** reasons on why observations of team interactions and work processes could contribute to understanding the internal dynamics of a team or organisation. (2)

e) When selecting methods for information collection, mention **TWO** factors that should be considered to ensure a comprehensive understanding of the problem. (2)

BrightIdeas Marketing Solutions has implemented a new Customer Relationship Management (CRM) system named ClientHub. This system aims to streamline client interactions, track marketing campaigns, and enhance overall client satisfaction. As the company acknowledges the critical role of maintenance in ensuring the longevity and efficiency of the CRM system, they are keen to evaluate and understand factors contributing to easy maintenance and potential issues in poorly designed or documented systems.

f) Provide **TWO** ways how a modular design in ClientHub's architecture enhances the system's maintainability. (2)

g) Discuss **TWO** ways in which documentation helps maintenance teams troubleshoot issues and implement updates effectively. (2)

h) Discuss **TWO** potential challenges that maintenance teams might face in understanding and navigating a system with a flawed design. (2)

i) Illustrate **TWO** specific scenarios where inadequate documentation could lead to increased downtime and inefficiencies in updating or troubleshooting ClientHub. (2)

j) Provide **TWO** examples of how structured programming techniques contribute to readability and maintainability of the system's codebase. (2)

(Total: 20 marks)

Question B4

Object-Oriented Programming is a programming paradigm that organises software design around the concept of "objects," which represent real-world entities or concepts.

a) Mention the **TWO** core principles associated with method overriding. (2)

b) Define the use of constructors in object creation. (1)

c) Define the use of an object in object-oriented programming. (1)

d) Describe default constructors and custom constructors. In your decription, highlight their differences. (2)

e) Explain how inheritance creates a hierarchy in object-oriented programming. (1)

f) Explain the purpose of the 'super' keyword in Java, and how it is used in relation to method overriding. (2)

g) How are static variables and methods different from instance variables and methods? (1)

Testing is the process of systematically evaluating a software application to identify any defects, errors, or deviations from the specified requirements.

h) A "dry run" for a complex software module needs to be performed.
    i.   Explain how the "dry run" should be carried out. (1)
    ii. List **TWO** key benefits of conducting a dry run. (2)

i) Mention **TWO** examples where integration testing would be crucial for ensuring the reliability of a software system. (2)

j) Black Box and White Box are two types of testing strategies.
    i.   Describe Black Box testing and White Box testing and highlight **ONE** key difference between them. (2)
    ii. Provide **ONE** example of a situation where both approaches could complement each other. (1)

k) In the context of test data, discuss the importance of using both valid and invalid inputs during testing. (2)

(Total: 20 marks)