



SUBJECT:	Information Technology
PAPER NUMBER:	I
DATE:	29 th August 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.

MediCare Solutions, a renowned healthcare organisation, wants to implement advanced technologies to streamline its medical services. The managers of MediCare Solutions are considering the possibility of integrating expert systems to assist healthcare professionals in diagnosis and treatment planning. The managers, however are aware of the ethical considerations and challenges associated with implementing such advanced systems in a critical domain like healthcare.

- a) Define what an expert system is in the context of healthcare. (2)
- b) Outline **FOUR** potential benefits of implementing expert systems in the healthcare sector. (4)
- c) Highlight **FOUR** challenges associated with the use of expert systems in the medical field. (4)
- d) Explain the concept of negligence in the context of information systems. (2)
- e) Discuss **TWO** potential effects of negligence on an organisation, particularly with respect to MediCare Solutions. (2)
- f) What is disaster planning and disaster recovery plan? Why is this important for MediCare solutions? (2)
- g) Define **FOUR** stages in disaster planning and disaster recovery plan. (4)

(Total: 20 marks)

Please turn the page.

Answer TWO questions from Questions A2, A3 and A4.

Question A2

Global Logistics, a shipping and logistics company, is considering upgrading its information processing systems to optimise various operations. The company deals with a vast amount of data related to cargo shipments, inventory management, and transportation scheduling. As part of this upgrade, Global Logistics aims to understand and implement different processing modes to enhance efficiency.

- a) Define batch processing in the context of information systems. (2)
 - b) Describe **TWO** scenarios, within Global Logistics, where batch processing would be highly suitable. (4)
 - c) Differentiate between master files and transaction files in information systems. (2)
 - d) Provide **TWO** examples of how master files could be used by Global Logistics. (2)
 - e) Provide **TWO** examples of how Global Logistics could use transaction files in their day-to-day operations. (2)
 - f) Mention **TWO** other processing modes which might be used by Global Logistics apart from batch processes, master file and transaction files. (2)
 - g) Explain **each** mode mentioned in part (f). (2)
 - h) Highlight **TWO** advantages and **TWO** disadvantages of **each** mode mentioned in part (f). (4)
- (Total: 20 marks)**

Question A3

A software development team is working on a new application designed for educational purposes. The goal is to create an interactive learning platform that effectively engages users. The team is considering various interface styles and incorporating emerging technologies to enhance the user experience.

- a) Explain the difference between short-term human memory and long-term memory. (2)
- b) How can an understanding of memory types mentioned in part (a) influence the design of the educational software being developed? Mention at least **THREE** points. (3)

The software development team are trying to include both text and graphics in their new application.

- c) Mention **THREE** advantages and **THREE** disadvantages of using both text and graphics in the user interface of the educational software. (6)
 - d) Discuss how a balance between text and graphics contributes to an effective learning experience for users. (2)
 - e) The team is evaluating different interface styles for the educational software. Mention and define the **TWO** main types of interfaces which are commonly used. (3)
 - f) List **ONE** advantage and **ONE** disadvantage of **each** interface mentioned in part (e). (4)
- (Total: 20 marks)**

Question A4

A secondary school teacher is explaining the different types of possible networks present in an organisation and the main types of communication media used in a network. He mentioned the LAN (Local Area Network) as an example.

- a) What is LAN? (1)
 - b) Describe **FOUR** types of LAN topologies. Drawings might be used but are **not** compulsory. (4)
 - c) Describe **THREE** other types of networks apart from LAN. (3)
 - d) Give **ONE** advantage and **ONE** disadvantage of **each** network mentioned in part (c). (6)
 - e) List and describe the **TWO** categories of communication media. (2)
 - f) Provide **TWO** examples of communication media for **each** category listed in part (e). (4)
- (Total: 20 marks)**

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.

A medium-sized advertising agency, 'CreativeHub,' is adapting to the digital era. They've recently integrated various Internet utilities to enhance communication within the agency and with clients. The main utilities used were newsgroups and discussion groups.

- a) Differentiate between newsgroups and discussion groups. (2)
 - b) Why do you think that 'CreativeHub' opted for newsgroups and discussion groups as their main communication tools? (1)
 - c) Provide **ONE** example of how a newsgroup could be used at 'CreativeHub'. (1)
 - d) Provide **ONE** example of how a discussion group could be used at 'CreativeHub'. (1)
 - e) Mention **FOUR** other Internet utilities, apart from newsgroups and discussion groups that can be used as human communication tools. (2)
 - f) Describe **each** of the **FOUR** Internet utilities mentioned in part (e). (4)
 - g) Outline **TWO** advantages and **TWO** disadvantages of using the Internet as a communication tool at 'CreativeHub'. (4)
- (Total: 15 marks)**

Questions continue on the next page.

Answer any TWO questions from B2, B3 and B4.

Question B2

A multinational technology company, 'TechSynergy,' is undergoing a restructuring phase to optimise its operations. The company operates in various regions, dealing with a range of products and projects. As part of this transformation, they are redefining departmental structures and reinforcing roles to enhance efficiency and security.

- a) Describe **THREE** modes how 'TechSynergy' can departmentalise their organisation. (3)
- b) Provide **ONE** advantage and **ONE** disadvantage for **each** of the modes listed in part (a). (6)
- c) The manager of 'TechSynergy' wants to implement a matrix organisational chart. Discuss whether this is a correct decision and justify your answer by providing appropriate reasoning. (2)
- d) Define the role of a Chief Information Officer (CIO) and explain how this position contributes to the overall success of 'TechSynergy'. (2)
- e) Define the role of a Chief Security Officer (CSO). In your answer, highlight the difference between CIO and CSO. (2)

(Total: 15 marks)

Question B3

YT is a voluntary organisation with an online portal where community members can access services, share information, and engage in community activities. The organisation aims to ensure the privacy of its individuals.

- a) Explain the concept of data protection in the context of online platforms. (1)
- b) Discuss, by providing at least **TWO** reasons, why protecting individual privacy is more challenging in the digital age compared to traditional systems. (2)
- c) Outline **FOUR** key principles of data protection as per the Data Protection Act in Malta which members of YT should keep in mind. (4)
- d) List exemptions to data protection regulations, by providing **ONE** example. (1)
- e) Define 'data subject'. (1)
- f) Provide **TWO** examples of individuals who might be considered as data subjects with respect to YT. (2)
- g) Discuss **TWO** rights of data subjects as outlined in data protection regulations. (2)
- h) Briefly describe the role of the Data Protection Commissioner. (2)

(Total: 15 marks)

Question B4

MetroTech Solutions, an expanding accounting consultancy firm, keeps track of ICT advancements to transform its operations and services. The company makes use of up-to-date ICT practices to improve productivity, enhance client interactions, and achieve overall business success. Additionally, Metro Solutions is exploring the implementation of e-Business strategies.

- a) Discuss the evolution of computing, highlighting the limited role it played in the past and its significantly broader role in today's modern world, with a focus on Metro Solutions. (2)
- b) List **FOUR** examples of how ICT can be used in the workplace, particularly by Metro Solutions. (4)
- c) Define the term e-Business and provide **TWO** reasons why it might be beneficial for MetroTech Solutions' operations. (3)
- d) Briefly explain the emergence of the e-Business phenomenon. (2)
- e) Outline **ONE** advantage and **ONE** disadvantage of e-Business for both MetroTech Solutions and its clients. (4)

(Total: 15 marks)



SUBJECT:	Information Technology
PAPER NUMBER:	II
DATE:	30 th August 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: SOFTWARE

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

Question A1

This is a compulsory question. Answer all parts.

In a dynamic university setting, the relational database captures student profiles, courses, and enrollments. This database allows scenarios to be explored like identifying top-performing students and popular majors through SQL queries, revealing insights into the academic pulse of the campus.

Table 1: Students Table

StudentID	FirstName	LastName	BirthDate
1	John	Doe	1995-03-15
2	Jane	Smith	1998-08-22
3	Alice	Johnson	1997-05-10
4	Bob	Williams	1996-11-30
5	Charlie	Brown	1999-04-05

Table 2: Courses Table

CourseID	CourseName	Credits
101	Maths	3
102	English	4
103	Physics	3
104	IT	4
105	Computing	4

Table 3: Enrollments Table

EnrollmentID	StudentID	CourseID	Grade
1	1	101	A
2	1	102	B
3	2	101	B+
4	2	104	A-
5	2	105	C
6	3	102	A
7	3	105	A-
8	4	103	B+
9	4	105	B+
10	5	104	A+

a) What is the output to the following SQL command? (2)

```
SELECT FirstName, LastName
FROM Students
WHERE BirthDate > '1996-12-31';
```

b) What is the output to the following SQL command? (2)

```
SELECT COUNT(Grade) AS GradeA
FROM Enrollments
WHERE Grade = 'A';
```

c) What is the output to the following SQL command? (4)

```
SELECT CourseName, COUNT(EnrollmentID) AS EnrolledStudents
FROM Enrollments
GROUP BY CourseID, CourseName
ORDER BY EnrolledStudents DESC;
```

d) What part of the code in part (c) is redundant in our scenario. (1)

e) Given the above tables, generate an ER diagram to represent the relationships between these entities. Include the necessary attributes, primary keys, and foreign keys and ensure that it accurately reflects the relationships described in the provided tables. (6)

(Total: 15 marks)

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

Question A2

Amy, a diligent employee at a technology firm, discovered herself entangled in a web of online security challenges. In the following questions, Amy's character serves as a scenario to explore various aspects of online security challenges and solutions. Each question builds on Amy's experiences, illustrating common scenarios individuals might encounter in the digital realm and how they can navigate or mitigate potential risks.

a) Amy receives an urgent email from what appears to be her bank, requesting her to update account details through a provided link. How does this situation align with a prevalent online security issue? (2)

b) After unknowingly falling victim to the attack in part (a), Amy notices unusual computer behavior and missing files. What kind of online security threat could she be facing at this point? (1)

c) Amy decides to install security software on her computer to address malware issue. How does the adoption of this solution contribute to mitigating various online security challenge? (2)

d) Amy decides to safeguard her online communications by utilising encrypted channels. How does the use of encryption contribute to online security, particularly in addressing the risk of unauthorised access during data transmission? (2)

e) Amy's workplace implements a firewall to enhance their network security. Explain how a firewall works to prevent Internet security problems, especially in the context of malware. (2)

f) Amy decides to digitally sign important documents to ensure their authenticity. How does the use of digital signatures and certificates address Internet security issues, particularly in the realm of communication? (2)

- g) Despite having implemented various security measures, Amy's colleague falls victim to a brute force attack on their password. How does this type of attack pose a threat, and what measures can be taken to mitigate it? (2)
- h) Amy decides to educate her colleagues about social engineering attacks. Provide an example of a social engineering scenario that could compromise Internet security, and suggest preventive measures. (2)

(Total: 15 marks)

Question A3

Normalisation is a process in database design that involves organising and structuring data in a relational database. By applying normalisation techniques, such as First Normal Form (1NF), Second Normal Form (2NF), and Third Normal Form (3NF), database designers can achieve a more efficient and reliable database structure.

- a) List **TWO** reasons why normalisation is important in the context of database design. (2)
- b) Explain the term "transitive dependency" and its significance in the context of normalisation. (2)
- c) Outline the role of functional dependencies in the normalisation process. (2)
- d) Outline the role of composite keys in normalisation and their impact on database design. (2)
- e) How does normalisation contribute to better data maintenance in a relational database? (2)
- f) Define the First Normal Form (1NF) and its significance in database normalisation. (2)
- g) List **THREE** potential drawbacks associated with excessive normalisation. (3)

(Total: 15 marks)

Question A4

HTML creates the structure and content of webpages, CSS handles the styling and layout, and JavaScript acts as a scripting language. These three technologies work together to form the foundation of web development, enabling the creation of visually appealing and interactive websites.

- a) What is the purpose of the <html> tag in HTML? (1)
- b) Explain the function of the <div> tag in HTML. (2)
- c) Differentiate between <h1>, <h2>, and <h3> tags in HTML. (1)
- d) Define the purposes of and tags in HTML. (2)
- e) Write a snippet of code that will create a hyperlink in an HTML document which opens an external website. (2)
- f) Explain why having a sitemap is important for search engine optimisation (SEO). (2)
- g) Explain the role of Javascript in web development. (2)
- h) Outline how users are able to connect to the Internet via a mobile phone. (1)
- i) Outline **ONE** advantage and **ONE** disadvantage of connecting to the Internet from a mobile device. (2)

(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 code snippet below in the Java programming language asks the user for a value and then displays the variable total.

```

1. class Total{
2.     public static void main (String args[]){
3.         Scanner input = new Scanner(System.in);
4.         int total = 1;
5.
6.         System.out.print("Enter num: ");
7.         int num = input.nextInt();
8.
9.         for (int i=1; i<=num; i++){
10.            total = total * i;
11.        }
12.
13.        System.out.println("Total is : " + total);
14.
15.    } //end of main method
16. } //end of class

```

- i. What is the output of the variable *total*, if the user enters a value of 5? (2)
 - ii. What is the function of this program? (3)
 - iii. What would happen if the variable *total* would be initialised as 0 in line 4? (1)
 - iv. List **TWO** reasons why it is important to initialise the 'total' variable as done in line 4. (2)
 - v. The above class will not compile. Identify the error and make the necessary changes. Clearly indicate the lines in which you are inserting/modifying the code. (2)
- b) CSS (Cascading Style Sheets) is a language for styling HTML and XML documents. It defines the visual appearance of web pages, specifying layout, colors, fonts, and other presentation aspects.
- i. Provide the correct syntax for linking an external CSS file called "styles.css" to an HTML document. (2)
 - ii. Outline **THREE** advantages of using an external CSS file over inline styles. (3)
- c) SQL (Structured Query Language) is a programming language designed for managing and manipulating data in a relational database.
- i. What is the primary purpose of Data Definition Language (DDL)? (1)
 - ii. List **TWO** SQL commands that are categorised under DDL. (2)
 - iii. What is the primary purpose of Data Manipulation Language (DML)? (1)
 - iv. List **ONE** SQL command that is categorised under DML. (1)

(Total: 20 marks)

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

Question B2

Problem-solving techniques encompass a set of systematic approaches and methodologies employed to analyse, understand, and address challenges or obstacles, with the goal of devising effective and efficient solutions.

- a) Differentiate between linear search and binary search algorithms. (2)
- b) Define the terms *serial*, *sequential*, *direct*, and *indexed-sequential* file organisations. (4)
- c) Provide **ONE** example scenario for sequential and **ONE** example scenario for direct file organisations. (2)
- d) What role do validation checks play in maintaining data integrity? (1)
- e) Explain the concept of range validation with an example. (1)
- f) Explain the significance of expressing solutions in pseudo code during the problem-solving phase. (2)
- g) How does the process of creating a two-dimensional array differ from that of a one-dimensional array? (2)
- h) Write the following Java code snippets.
 - i. Fill a one-dimensional array with sequential values. (4)
 - ii. Display the filled array in (i). (2)

(Total: 20 marks)

Question B3

Systems development involves a systematic, structured approach to developing software or hardware solutions, with the goal of improving efficiency, solving problems, or addressing specific needs within an organisation.

- a) "TELOS" is an acronym that represents a set of criteria used in feasibility studies for evaluating the viability of a project. The following questions will be framed as real-life scenarios. Identify to which "TELOS" feasibility each scenario is related.
 - i. A company is considering upgrading its outdated computer systems to improve performance and security. (1)
 - ii. A startup is assessing whether its proposed project is financially viable and can generate profits. (1)
 - iii. A healthcare organisation is ensuring that its new patient management system adheres to all healthcare regulations. (1)
 - iv. An e-commerce company is analysing whether its proposed changes to the order fulfillment process can be smoothly implemented. (1)
 - v. A manufacturing company is investigating whether the proposed changes in production methods will be easily accepted by the workforce. (1)

Question continues on next page.

- b) There are several methods utilised to collect information about companies processes. In the following questions, analyse which collection method was used to gather the information.
- i. What method involves direct interaction with individuals to gather information? (1)
 - ii. Which data collection method allows respondents to provide written responses to a set of questions? (1)
 - iii. In which method do researchers directly watch and record behaviors, events, or activities? (1)
 - iv. In which method are researchers looking for patterns, themes, or meanings in textual or visual data? (1)
 - v. Which method is valuable for studying behaviors in their natural context without interference? (1)
- c) Mention **TWO** examples where a batch processing system would be more suitable than an on-line system. (2)
- d) Mention **TWO** scenarios where real-time processing is crucial. (2)
- e) Explain why is it important to consider user interface needs during the early stages of systems analysis. (1)
- f) Explain how the top-down approach aids in understanding complex systems during analysis. (1)
- g) How does the bottom-up approach contribute to modularisation in system design? (2)
- h) What role do data flow diagrams (DFDs) play in both top-down and bottom-up approaches in structured systems analysis? (2)

(Total: 20 marks)

Question B4

Object-Oriented Programming (OOP) is a programming paradigm that organises and structures code based on the concept of objects.

- a) List and describe **TWO** differences between Imperative and Object-Oriented Programming Paradigms. (4)
- b) List **TWO** other programming paradigms. (2)
- c) Mention **ONE** area of application for **EACH** of the programming paradigms listed in part (b). (2)
- d) Using the JAVA programming language, provide a code snippet for **EACH** of the following:
 - i. abstraction; (3)
 - ii. inheritance; (2)
 - iii. encapsulation; (3)
 - iv. polymorphism. (3)
- e) Define the use of instance variables in JAVA. (1)

(Total: 20 marks)