Computer Science Paper 1
Basic Theory
Model Paper 2025

Time Allowed: 1 hour 45 minutes
Total Marks: 65

You must answer on the question paper.

You must bring a soft pencil (preferably type B or HB), a clean eraser, and a dark blue or black pen. You may use a simple calculator if needed.

Before attempting the paper, write your name, candidate number, centre name, and centre number clearly in the designated spaces.

Instructions for Candidates

- Answer all questions.
- Write your answer to each question in the space provided.
- You must show all necessary working clearly.
- Do not use an erasable pen or correction fluid.
- Avoid writing over any barcodes printed on the paper.

Information for Candidates

- This paper consists of a total of **65 marks**.
- The number of marks assigned for every question or its parts is indicated within brackets [ ].

Please read all questions carefully and follow the instructions exactly to ensure your responses are properly evaluated.

Q1.

(a) Convert the decimal number 57.43 into binary (base 2). [2]

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(b) Perform the binary addition: $11001_2 + 1011_2$ [1]

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(c) Differentiate between ASCII and Unicode with one example each. [2]

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(d) Explain how increasing the sample resolution affects the quality and file size of a digital audio recording. [2]

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(e) Explain how binary representations of real numbers can cause rounding errors. [2]

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Q1 TOTAL: 9

Q2.

(a) Define a client server network and a peer-to-peer network. [2]

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(b) Compare LAN and WAN in terms of coverage and hardware requirements. [2]

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(c) State two advantages of using packet switching over circuit switching. [2]

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(d) A user types the given URL into their web browser.

www.hospitalrecords.com

Investigate how the DNS helps in converting this URL into an IP address so that the correct server can be accessed. [2]

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Q2 TOTAL: 8

Q3.

(a) Complete the table below to show one difference between PROM, EPROM, and EEPROM. [3]

Memory Type	Difference / Feature
PROM	
EPROM	
EEPROM	

(b) Find the reduced expression of the given truth table using Karnaugh map? [2]

A	B	C	Q
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1
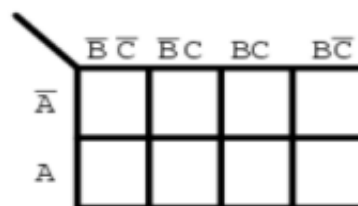
Expression:……………………………………………………………………..………………………………
………

(c) Using Boolean identities, reduce the given Boolean expression: [2]

$$F = \bar{X}Y + Y\bar{Z} + YZ + X\bar{Y}\bar{Z}$$

………
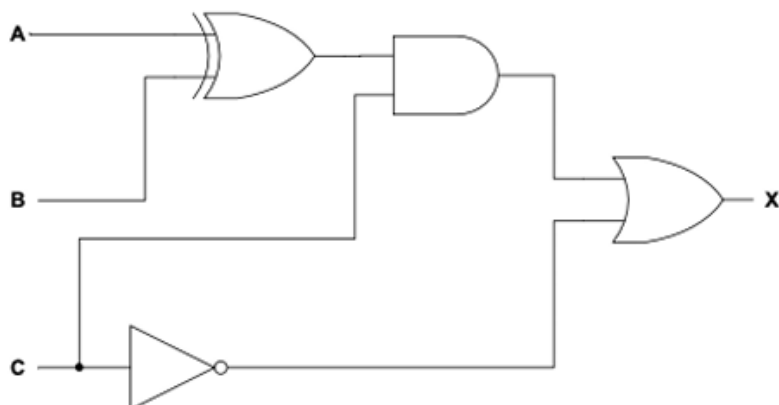………
………
………
………
………
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(d) Complete the truth table for the given logic circuit.   [4]

A	B	C	Working space	X
0	0	0		1
0	0	1		0
0	1	0		1
0	1	1		1
1	0	0		1
1	0	1		1
1	1	0		1
1	1	1		0

Q3 TOTAL: 11

Q4.

(a) Classify the following assembly language instructions as control , data movement or arithmetic. Also, explain in one sentence what each instruction does.   [3]

> MOV AX, BX
> ADD AX, 5
> JMP LOOP

MOV AX, BX: ………
……
ADD AX, 5: ……
……
JMP LOOP: …….
……………..……

(b) Fill the gaps in the given diagram of Von Neumann architecture.   [3]
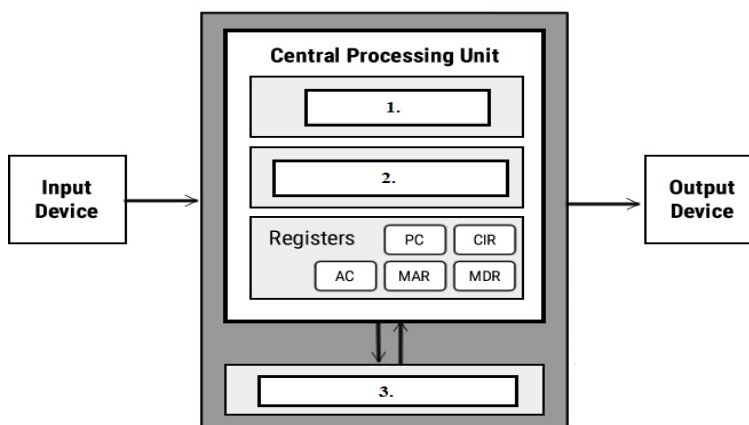
1. ………
2. ………
3. ………...

(c) The following assembly program is executed on a simple computer system. The contents of memory are:
- Memory location 10 = 5
- Memory location 15 = 3 [2]

```
LDA 10
ADD 15
STA 20
HLT
```

Dry run the program and show the contents of the accumulator after each instruction.

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……
……
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Q4 TOTAL: 8

Q5.

A university computer lab is being set up with new systems. Students will be using different types of software and development tools.

(a) Complete the diagram to show the classification of system software. [4]

System software
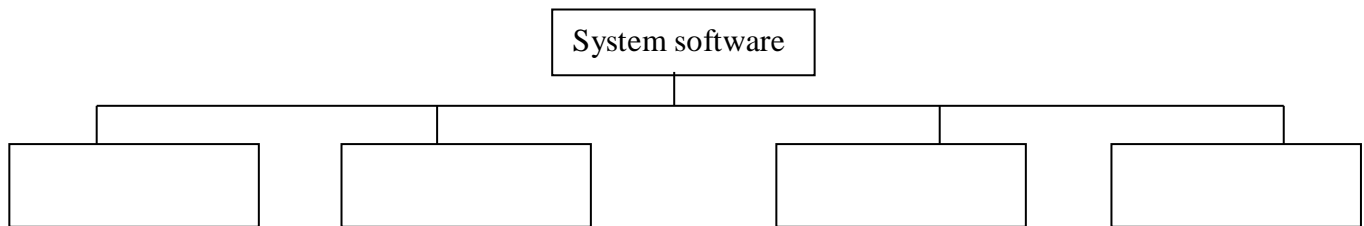
(b) The programmers at the hospital use program libraries (including DLL files) during development. Explain one benefit of using a program library. [2]

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(c) A software company is creating a mobile app that needs frequent testing and debugging during development. Assess whether an interpreter or a compiler would be more suitable for the developers. Justify your answer. [3]

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(d) Identify two features of an Integrated Development Environment (IDE) that can support programmers working on the hospital system. [2]

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……
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Q5 TOTAL: 11

Q6.

(a)An e-commerce website stores customer details, including addresses, credit card numbers, and passwords. Assess two methods the company can use to secure customer data. [2]

1. ……………………………………………………………………………………………………

……………………………………………………………………………………………………

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2. ……………………………………………………………………………………………………

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(b) State three reasons why SSL/TLS is important for secure online transactions. [3]

1. ……………………………………………………………………………………………..……..

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2. ……………………………………………………………………………………………….…..

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3. ……………………………………………………………………………………………….…..

……………………………………………………………………………………………………..

(c) A company is worried about phishing emails. Suggest two measures it could use to prevent or restrict this threat. [2]

1. …………………………………………………………………………………………………

………………………………………………………………………………………………

2. …………………………………………………………………………………………………

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Q6 TOTAL: 7

Q7.

(a) A software developer installs unlicensed (pirated) software on office computers to save money.
Identify one ethical issue in this situation and suggest two possible consequences of this unethical action. [3]

Ethical issue: ....

……………………………………………………………………………………………………….

Consequences:

1. …………………………………………………………………………………………………

……………………………………………………………………………………………………

……………………………………………………………………………………………………..

2. ...…………………………………………………………………………………………………

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(b) Self-driving cars rely heavily on Artificial Intelligence.
Evaluate two benefits and two drawbacks of using AI in such vehicles. [4]

Benefits:

1. …………………………………………………………………………………………………

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2. ...…………………………………………………………………………………………………

……………………………………………………………………………………………………

Drawbacks:

1. …………………………………………………………………………………………………

……………………………………………………………………………………………………

2. ...…………………………………………………………………………………………………

……………………………………………………………………………………………………

(c) Fill in the boxes with the correct type of software license.   [4]

Features	Open-source (A)	Proprietary (B)
1. Source code is available for users to view and modify	☐	☐
2. Users must purchase a license to use the software	☐	☐
3. Encourages collaboration and community development	☐	☐
4. Source code is hidden and cannot be changed by users	☐	☐

Q7 TOTAL: 11

Computer Science Paper 1
Basic Theory
Answering key & Marking Scheme
Model Paper 2025

Time Allowed: 1 hour 45 minutes
Total Marks: 65

You must answer on the question paper.

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Q1.

(a) Convert the decimal number 57.43 into binary (base 2). [2]

Answer:

Integer part (57):

$57 \div 2 \rightarrow 28$ R1

$28 \div 2 \rightarrow 14$ R0

$14 \div 2 \rightarrow 7$ R0

$7 \div 2 \rightarrow 3$ R1

$3 \div 2 \rightarrow 1$ R1

$1 \div 2 \rightarrow 0$ R1   Integer part in binary = 111001

Fractional part (0.43):

$0.43 \times 2 = 0.86 \rightarrow 0$

$0.86 \times 2 = 1.72 \rightarrow 1$

$0.72 \times 2 = 1.44 \rightarrow 1$

$0.44 \times 2 = 0.88 \rightarrow 0$

$0.88 \times 2 = 1.76 \rightarrow 1$

$0.76 \times 2 = 1.52 \rightarrow 1$ Fractional part $\approx$ .011011

$57.43_{10} = 111001.011011_{2}$

Marking Scheme:

- 1 mark for correctly converting the integer part (111001).
- 1 mark for correct fractional part up to 5–6 binary digits (.011011).

(b) Perform the binary addition: $11001_{2} + 1011_{2}$ [1]

Answer:

```
  11001
+  1011
-------------
 100100
```

Final Answer: 100100_{2}

Marking Scheme:

- 1 mark for correctly adding all bits and giving the correct binary sum (100100_{2}).
- No half marks; all working must lead to the correct final answer.

(c) Differentiate between ASCII and Unicode with one example each. [2]

Answer:

Basis	ASCII	Unicode
Definition	Uses 7 or 8 bits to represent characters (up to 256 characters).	Uses 16 bits or more to represent characters (over 65,000 characters).
Character Support	Supports English letters, digits, and basic symbols only.	Supports characters from multiple languages and symbols worldwide.
Example	'A' = 65	'A' = U+0041

Marking Scheme:

- 1 mark for correctly differentiating ASCII and Unicode (bit size / character range).
- 1 mark for giving a valid example for each encoding system.

(d) Explain how increasing the sample resolution affects the quality and file size of a digital audio recording. [2]

Answer:

Increasing the sample resolution allows each sample to store more bits, resulting in higher sound accuracy and better audio quality. However, it also increases the amount of data stored, which makes the file size larger.

Marking Scheme:

- 1 mark for stating that higher sample resolution improves audio quality.
- 1 mark for stating that it increases file size.

(e) Explain how binary representations of real numbers can cause rounding errors. [2]

Answer:

Some decimal fractions cannot be represented exactly in binary form because they repeat infinitely. When stored, the computer cuts off the extra digits, approximating the value. This approximation leads to small differences between the actual and stored values, known as rounding errors.

Marking Scheme:

- 1 mark for stating that some decimal fractions cannot be represented exactly in binary.
- 1 mark for explaining that truncation/approximation causes rounding errors.

Q1 TOTAL: 9

Q2.

(a) Define a client server network and a peer-to-peer network. [2]

Answer:

A **client-server network** is a network where computers (clients) request and receive services or resources from a central computer (server).

A **peer-to-peer (P2P) network** is a network where all computers have equal status and can share resources directly without a central server.

Marking Scheme:

- 1 mark for correct definition of client-server network.
- 1 mark for correct definition of peer-to-peer network.

(b) Compare LAN and WAN in terms of coverage and hardware requirements. [2]

Answer:

A **LAN (Local Area Network)** covers a small geographical area such as a building or campus and typically uses switches, hubs, and network cables.

A **WAN (Wide Area Network)** covers a large geographical area, such as cities or countries, and requires routers, modems, and communication links like satellites or leased lines.

Marking Scheme:

- 1 mark for correct comparison of coverage.
- 1 mark for correct comparison of hardware requirements.

(c) State two advantages of using packet switching over circuit switching. [2]

Answer:

1.   Packet switching makes more efficient use of network bandwidth since packets can take different routes and share communication lines.

2.   It is more reliable because if one route fails, packets can be redirected through alternate paths.

Marking Scheme:
* 1 mark for each correct advantage.

(d) A user types the given URL into their web browser.

www.hospitalrecords.com

Investigate how the DNS helps in converting this URL into an IP address so that the correct server can be accessed.   **[2]**

Answer:

When the user enters the URL, the DNS (Domain Name System) checks its database to find the corresponding IP address for *www.hospitalrecords.com*. If it's not found locally, the request is sent to higher-level DNS servers until the correct IP address is located and returned to the browser, which then connects to the web server.

Marking Scheme:
* 1 mark for describing DNS translating the domain name to an IP address.
* 1 mark for mentioning query resolution through DNS hierarchy or returning the IP to the browser.

Q2 TOTAL: 8

Q3.

(a) Complete the table below to show one difference between PROM, EPROM, and EEPROM.   **[3]**

Answer:

Memory Type	Difference / Feature
PROM	Programmed only once; cannot be erased or rewritten.
EPROM	Can be erased using ultraviolet light and then reprogrammed.
EEPROM	Can be erased and reprogrammed electrically while in the circuit.

Marking Scheme:
* 1 mark for PROM.
* 1 mark for EPROM.
* 1 mark for EEPROM.
*

(b) Find the reduced expression of the given truth table using Karnaugh map?   **[2]**

A	B	C	Q
0	0	0	0
0	0	1	0
0	1	0	1
0	1	1	1
1	0	0	0
1	0	1	1
1	1	0	0
1	1	1	1
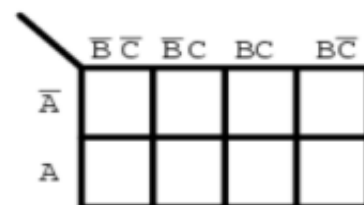
Answer:

Expression: $Q = \bar{A}B + AC$

Marking Scheme:

* 1 mark for correct grouping or minterm identification. (2 required)

(c) Using Boolean identities, reduce the given Boolean expression: [2]
$$F = \bar{X}Y + Y\bar{Z} + YZ + X\bar{Y}\bar{Z}$$

Answer:

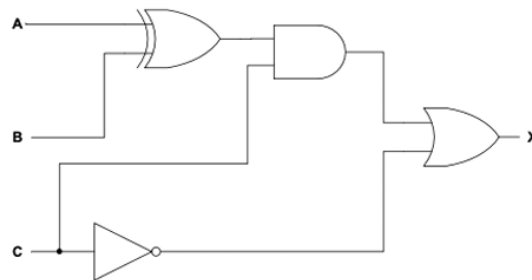|	
[Using distributive law]	$= \bar{X}Y + Y(\bar{Z} + Z) + X\bar{Y}\bar{Z}$
[Because $\bar{Z} + Z = 1$]	$= \bar{X}Y + Y(1) + X\bar{Y}\bar{Z}$
	$= \bar{X}Y + Y + X\bar{Y}\bar{Z}$
[Because $\bar{X}Y + Y = Y$]	$= Y + X\bar{Y}\bar{Z}$
[Using absorption law: $Y + X\bar{Y} = Y + X\bar{Z}$]	$= Y + X\bar{Z}$

Marking Scheme:
- 1 mark for applying Boolean simplification correctly.
- 1 mark for correct final reduced expression **F = Y + X$\bar{Z}$**.

(d) Complete the truth table for the given logic circuit. [4]

Answer:

A	B	C	A XOR B	(A XOR B) AND C	NOT C	((A XOR B) AND C) OR (NOT C)
0	0	0	0	0	1	1
0	0	1	0	0	0	0
0	1	0	1	0	1	1
0	1	1	1	1	0	1
1	0	0	1	0	1	1
1	0	1	1	1	0	1
1	1	0	0	0	1	1
1	1	1	0	0	0	0

Marking Scheme:
- 1 mark for 2–3 correct rows
- 2 marks for 4–5 correct rows
- 3 marks for 6–7 correct rows
- 4 marks for all 8 rows correct

Q3 TOTAL: 11

Q4.
(a) **Classify the following assembly language instructions as control , data movement or arithmetic. Also, explain in one sentence what each instruction does.**
   **[3]**

```
MOV AX, BX
ADD AX, 5
JMP LOOP
```

Answer:

Instruction	Type	Explanation
MOV AX, BX	Data Movement	Copies the contents of register BX into register AX.
ADD AX, 5	Arithmetic	Adds value 5 to the contents of register AX and stores result in AX.
JMP LOOP	Control	Transfers program execution to the instruction labeled "LOOP."

Marking Scheme:
- 1 mark for correctly identifying and explaining each instruction type(All THREE required)

(b)   Fill the gaps in the given diagram of Von Neumann architecture.   [3]
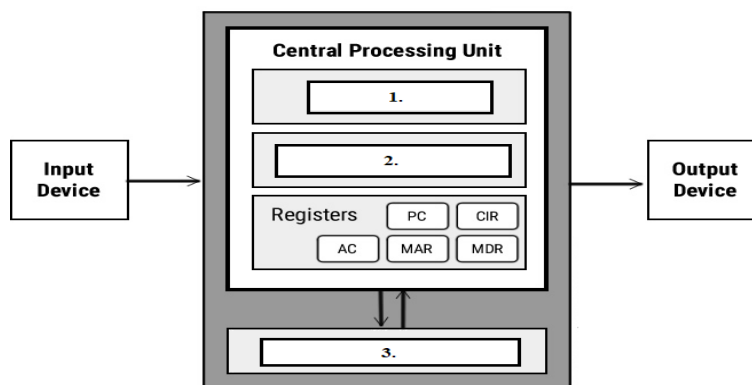
Answer:
1. Control Unit (CU)
2. Arithmetic Logic Unit (ALU)
3. Main Memory

Marking Scheme:
- 1 mark for each correct label (All THREE required)

(c)   The following assembly program is executed on a simple computer system. The contents of memory are: [2]
- **Memory location 10 = 5**
- **Memory location 15 = 3**

```
LDA 10
ADD 15
STA 20
HLT
```

Dry run the program and show the contents of the accumulator after each instruction.

Answer:

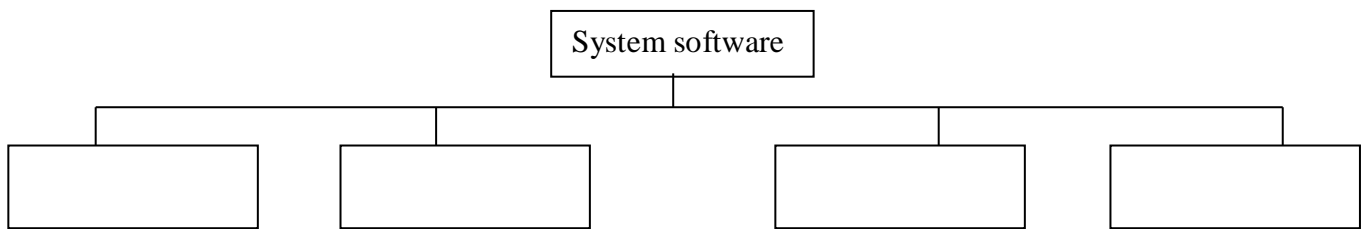| Instruction	Description	Accumulator Content
LDA 10	Loads the value from memory location 10 (which is 5) into the accumulator.	5
ADD 15	Adds the value from memory location 15 (which is 3) to the accumulator.	8
STA 20	Stores the value 8 from the accumulator into memory location 20.	8
HLT	Stops program execution.	8

Marking Scheme:
- 1 mark for correct accumulator content after LDA and ADD.
- 1 mark for correct accumulator content after STA and HLT.

Q5.

A university computer lab is being set up with new systems. Students will be using different types of software and development tools.

(a) Complete the diagram to show the classification of system software. **[4]**

```
                        ┌──────────────────┐
                        │ System software  │
                        └──────────────────┘
            ┌───────────────┬───────────────┬───────────────┐
    ┌───────────┐   ┌───────────┐   ┌───────────┐   ┌───────────┐
    │           │   │           │   │           │   │           │
    └───────────┘   └───────────┘   └───────────┘   └───────────┘
```

Answer:
Operating System
Utility Programs
Device Drivers
Language Processors

Marking Scheme:
- 1 mark for each correct label (All FOUR required)

(b) The programmers at the hospital use program libraries (including DLL files) during development. Explain one benefit of using a program library. **[2]**

Answer:
Using a program library allows programmers to reuse reliable code, which saves development time and reduces errors.
In the hospital scenario, this ensures that medical software runs efficiently and accurately, using tested library functions (like DLLs) for critical tasks.

Marking Scheme:
- 1 mark for stating a benefit (e.g., saves time / reduces errors / ensures reliability)
- 1 mark for relating to the hospital scenario (e.g., ensures accurate, reliable medical software)

(c) A software company is creating a mobile app that needs frequent testing and debugging during development. Assess whether an interpreter or a compiler would be more suitable for the developers. Justify your answer. **[3]**

Answer:
An interpreter would be more suitable because it translates and executes the code line by line, allowing developers to identify and fix errors immediately during testing. This makes debugging faster and more efficient.
A compiler, on the other hand, translates the entire program before execution, which would slow down frequent testing and debugging.

Marking Scheme:
• 1 mark for identifying interpreter as the suitable option
• 1 mark for justification (line-by-line execution helps in debugging)
• 1 mark for comparison with compiler (slower or less suitable for frequent testing)

(d) Identify two features of an Integrated Development Environment (IDE) that can support programmers working on the hospital system. **[2]**

Answer:

Two features of an IDE that can support programmers are:

1.   Debugger – helps identify and fix errors in the hospital system's code.

2.   Code Editor – provides syntax highlighting and auto-completion to make coding faster and more accurate.

Marking Scheme:

• 1 mark for each correctly identified and explained IDE feature (TWO required)

Q5 TOTAL: 11

Q6.

(a) An e-commerce website stores customer details, including addresses, credit card numbers, and passwords. Assess two methods the company can use to secure customer data. **[2]**

Answer:

Two methods to secure customer data are:

1.   Encryption – converts sensitive data like credit card numbers into unreadable form, protecting it from unauthorized access.

2.   Authentication – ensures only authorized users can access accounts, for example through strong passwords or two-factor authentication.

Marking Scheme:

• 1 mark for each correctly stated and explained method of data security (TWO required)

(b) State three reasons why SSL/TLS is important for secure online transactions. **[3]**

Answer:

1.   SSL/TLS encrypts data transmitted between the user and the server, preventing unauthorized access.

2.   It ensures data integrity, so information cannot be altered during transmission.

3.   It authenticates the website's identity, assuring users that they are communicating with a legitimate source.

Marking Scheme:

• 1 mark for each correct reason related to SSL/TLS importance (THREE required)

(c) A company is worried about phishing emails. Suggest two measures it could use to prevent or restrict this threat. **[2]**

Answer:

1.   Use email filtering software to detect and block phishing messages before they reach users.

2.   Provide staff training to help employees identify suspicious links and avoid revealing sensitive information.

Marking Scheme:

• 1 mark for each valid preventive measure (TWO required)

Q6 TOTAL: 7

Q7.

(a) A software developer installs unlicensed (pirated) software on office computers to save money.
 Identify one ethical issue in this situation and suggest two possible consequences of this unethical action.   **[3]**

Answer:

Ethical issue: Using unlicensed software violates intellectual property rights.

Consequences:

1.   The company may face legal action or fines for copyright infringement.

2.   Pirated software may contain malware, putting company data and systems at risk.

Marking Scheme:

• 1 mark for identifying the ethical issue

• 1 mark for each valid consequence (TWO required)

(b) Self-driving cars rely heavily on Artificial Intelligence.
     Evaluate two benefits and two drawbacks of using AI in such vehicles.   **[4]**

Answer:

Benefits:

1.   AI can reduce human error, leading to fewer road accidents.

2.   It improves traffic efficiency by optimizing routes and reducing congestion.

Drawbacks:

1.   AI systems may malfunction or fail to respond correctly in unpredictable situations.

2.   Ethical dilemmas arise in accident scenarios where the AI must choose between harmful outcomes.

Marking Scheme:

• 1 mark for each valid benefit (TWO required)

• 1 mark for each valid drawback (TWO required)

(c) Fill in the boxes with the correct type of software license.   **[4]**

Features	Open-source (A)	Proprietary (B)
1. Source code is available for users to view and modify	■	☐
2. Users must purchase a license to use the software	☐	■
3. Encourages collaboration and community development	■	☐
4. Source code is hidden and cannot be changed by users	☐	■

Marking Scheme:

• 1 mark for each correctly matched feature (FOUR required)

Q7 TOTAL: 11