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සියලු ම හිමිකම් ඇවිරිණි /முழுப் பதிப்புரிமையுடையது /All Rights Reserved]

ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව இலங்கைப் பரீட்சைத் திணைக்களம் Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2026
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2026
General Certificate of Education (Adv. Level) Examination, 2026

තොරතුරු හා සන්නිවේදන තාක්ෂණය I தகவல், தொடர்பாடல் தொழினுட்பவியல் I **Information & Communication Technology I**	**20 E I**	පැය දෙකයි இரண்டு மணித்தியாலம் ***Two hours***

Instructions:

- *Answer **all** the questions.*
- *Write your **Index Number** in the space provided in the answer sheet.*
- *Instructions are also given on the back of the answer sheet. Follow those carefully.*
- *In each of the questions **1** to **50**, pick one of the alternatives from (1), (2), (3), (4), (5) which is **correct or most appropriate** and **mark your response on the answer sheet with a cross** (×) **in accordance with the instructions given on the back of the answer sheet.***
- *Use of calculators is **not allowed**.*

1. Which of the following tasks requires real-time processing?
(1) Printing monthly bank statements for account holders
(2) Generating water bills for customers
(3) Verifying and approving fingerprints at the office entrance
(4) Printing name badges for attendees before a conference
(5) Compiling annual leave summary of employees

2. A student registration system validates user inputs using the following rules:
- The "Date of Birth" field cannot be blank.
- The "Telephone Number" must contain only numeric characters.
- The value of the "Grade" field must be within 1 to 13.

Which of the following correctly lists the corresponding data validation checks for the above three rules in the respective order?
(1) Range check, Presence check, Type check
(2) Presence check, Range check, Type check
(3) Type check, Presence check, Range check
(4) Presence check, Type check, Range check
(5) Range check, Type check, Presence check

3. Which of the following storage media does **not** allow the users to write or erase data?
(1) CD-ROM (2) CD-RW (3) Floppy disk
(4) Hard disk (5) Flash drive

4. Which of the following operation(s) involve(s) the control bus?
A – The CPU sending a read signal to the Main Memory
B – Transferring a data word from the Main Memory to the CPU
C – Carrying the memory address of the data word to be accessed
(1) A only (2) B only (3) A and B only
(4) A and C only (5) All A, B and C

5. During program execution, which of the following stores the memory address of the next instruction to be executed?
(1) accumulator (2) arithmetic and logic unit (ALU)
(3) instruction register (4) program counter
(5) data bus

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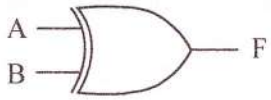
6. What is the 2's complement binary representation of –1 in an 8-bit system?
(1) 11111111 (2) 00000000 (3) 00000001 (4) 10000000 (5) 11111110

7. If the Unicode code point for A is hexadecimal 41, what does 4E414D45 represent?
(1) NAVY (2) NAME (3) FOOD (4) GAME (5) CAPE

8. Which of the following statement(s) regarding number system conversions is/are correct?
A – $9A_{16} = 10011010_2$
B – $93_{10} = 1011101_2$
C – $645_8 = 110100111_2$
(1) A only (2) A and B only (3) A and C only
(4) B and C only (5) All A, B and C

9. What is the correct binary equivalent of decimal 14.3125_{10}?
(1) 1101.0101_2 (2) 1101.1010_2 (3) 1111.0110_2 (4) 1110.0101_2 (5) 1110.1010_2

10. The diagram shows a two-input X-OR gate.



If A=1, the output F is,
(1) 1 (2) 0 (3) A (4) B (5) $\overline{B}$

11. The boolean expression $AB+A\overline{B}+AC$ is equal to
(1) A (2) B (3) C (4) $\overline{A}$ (5) A + C

12. Which of the following media is most likely to be affected by Electro-Magnetic Interference?
(1) UTP (2) Microwaves (3) STP
(4) Co-axial cable (5) Fibre optic

13. What is the network mask that equally divides the entire IPv4 address space into 4 subnets?
(1) /2 (2) /4 (3) /8 (4) /24 (5) /26

14. In the local area network in a school laboratory, in what form does a switch forward data between computers?
(1) messages (2) segments (3) packets (4) frames (5) bits

15. FTP uses TCP as its transport layer protocol instead of UDP, because TCP:
A – ensures reliable delivery of data.
B – delivers data in the correct order.
C – uses encryption to secure data.
The correct statement(s) from the above is/are
(1) A only. (2) A and B only. (3) A and C only.
(4) B and C only. (5) all A, B and C.

16. Consider the following events that occur when a user accesses a website by entering its URL in a web browser:
A – The DNS client sends a query for the domain name to the DNS server.
B – The browser sends its page request to the web server using the received IP address.
C – The DNS client passes the IP address to the browser.
D – The browser passes the domain name of the URL to the DNS client in the user's computer.
E – The DNS server sends the matching IP address to the DNS client.
Which of the following is the correct order of the above events?
(1) A–E–D–C–B (2) B–D–A–E–C (3) D–A–C–E–B
(4) D–A–E–C–B (5) D–C–A–E–B

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17. Which of the following regarding Asymmetric Key Encryption is correct?
(1) Encryption of data with a public key verifies authentication of the sender.
(2) The public key and private key are identical.
(3) A message encrypted using a private key can only be decrypted using the same private key.
(4) Public key cannot be used for decryption.
(5) A message encrypted using a private key can only be decrypted using the corresponding public key.

18. Which of the following requires/require Network Address Translation (NAT)?
A – When the LAN has servers in it.
B – When the LAN is wireless.
C – When the LAN uses private IP addresses.
(1) A only (2) B only (3) C only
(4) A and B only (5) A and C only

19. Match the **Systems** labelled from A1 – A3 with the **Descriptions** labelled from B1 – B3.

System	Description
A1 – Expert System (ES)	B1 – A system that facilitates authorised staff without programming knowledge to modify what is displayed on the organization's website.
A2 – Management Information System (MIS)	B2 – A system that transforms the records generated by daily business activities into organized summaries for routine decision-making.
A3 – Content Management System (CMS)	B3 – A system that suggests the action for a given situation using the experiences of senior staff stored within it.

Which of the following provides the correct match?
(1) A1 – B1, A2 – B2, A3 – B3
(2) A1 – B2, A2 – B3, A3 – B1
(3) A1 – B2, A2 – B1, A3 – B3
(4) A1 – B3, A2 – B1, A3 – B2
(5) A1 – B3, A2 – B2, A3 – B1

20. A software development team is assigned to develop a small system with low technical risk. The client is unable to clearly specify the system requirements, but can provide useful feedback after sample interfaces are shown. The client does not need this system urgently.
Which of the following system development models is most suitable for this project?
(1) Waterfall model (2) Spiral model (3) Agile model
(4) Prototyping (5) RAD

21. Which of the following statement(s) regarding the classification of systems is/are correct?
A – A sealed chemical reaction flask in a laboratory can be considered a closed system.
B – A school is an open, man-made system as it interacts with its environment.
C – Every natural system is a living system.
(1) A only (2) B only (3) A and B only
(4) B and C only (5) All A, B and C

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22. A school plans to computerize student attendance and term-test marks. The feasibility study found that:

A – entering attendance student-by-student each morning would delay the first period.
B – the cost of the proposed equipment would exceed the annual budget allocation.
C – maintaining records in the school's own system conflicts with the Ministry's policy of storing all school records centrally.

Which of the following correctly matches with the feasibility types?

(1) A – operational, B – economic, C – organizational
(2) A – technical, B – economic, C – operational
(3) A – operational, B – technical, C – organizational
(4) A – organizational, B – economic, C – operational
(5) A – technical, B – operational, C – organizational

23. Which of the following is a functional requirement of an online cinema ticket booking system?

(1) The system should be available 99.9% of the time.
(2) The system should respond to any search within 2 seconds.
(3) The system should allow the customer to select seats from a seating plan.
(4) The system interface should be easy to use for a new user.
(5) The system should support up to 5000 concurrent users.

24. Consider the following statements with blanks labelled A, B, and C:

In .....A..... testing, a programmer prepared test data to ensure every IF condition is executed.
In .....B..... testing, the data passed between the combined modules was checked.
In .....C..... testing, the office staff used the software for their daily work and decided whether to approve it.

Which of the following is the correct combination for A, B and C?

(1) A – white-box, B – integration, C – acceptance
(2) A – black-box, B – integration, C – system
(3) A – white-box, B – system, C – acceptance
(4) A – black-box, B – white-box, C – integration
(5) A – white-box, B – system, C – integration

25. A bank is replacing its core banking software with a Commercial-Off-The-Shelf (COTS) package. Which of the following statement(s) is/are correct?

A – Parallel deployment is recommended, because a failure of the system would be critical.
B – Recurring licensing fees can be a cost associated with using COTS packages.
C – A COTS package will always match the bank's existing business processes without any customization.

(1) A only (2) B only (3) A and B only
(4) B and C only (5) All A, B and C

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26. Consider the following **descriptions** of three database **models** X, Y and Z:

Model	Description
X	Data is organized as a collection of interconnected records, where a record may participate in multiple parent–child relationships.
Y	Data is organized using parent–child relationships, where each child node has only one parent node.
Z	Data is organized into a group of collections of logically related records, where records are related to one another through shared attribute values.

Which of the following correctly identifies Models X, Y, and Z respectively?

(1) Hierarchical, Network, Relational
(2) Relational, Hierarchical, Network
(3) Network, Relational, Object-Relational
(4) Object-Relational, Hierarchical, Relational
(5) Network, Hierarchical, Relational

27. Which of the following statements is **always** true regarding PRIMARY KEY and UNIQUE constraint in a relational database?

(1) A PRIMARY KEY and a UNIQUE constraint both enforce uniqueness, but only a PRIMARY KEY can be used to identify tuples in a relation.
(2) A relation may contain multiple UNIQUE constraints, whereas it can contain only one PRIMARY KEY.
(3) A UNIQUE constraint is used to establish relationships between relations, whereas a PRIMARY KEY is only used to enforce uniqueness.
(4) A PRIMARY KEY must consist of a single attribute, whereas a UNIQUE constraint may consist of multiple attributes.
(5) A relation may contain multiple PRIMARY KEYs, whereas it can contain only one UNIQUE constraint.

28. Consider the following relation:

```
COURSE (
CourseID PRIMARY KEY,
CourseName UNIQUE,
Credits CHECK (Credits BETWEEN 1 AND 4 ))
```

Which of the following statements is correct?

(1) A course can be inserted with Credits = 0 as long as no other course has the same CourseID.
(2) The UNIQUE constraint on CourseName does not allow NULL values for CourseName.
(3) Two courses can share the same CourseName provided their CourseID values differ.
(4) The CHECK constraint on Credits ensures no two courses share the same credit value.
(5) Both CourseID and CourseName are unique attributes, but only CourseID does not allow NULL values.

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29. Consider the following relation:

```
STUDENT(
StudentID VARCHAR(10) PRIMARY KEY,
NIC VARCHAR(12) UNIQUE,
Age INTEGER CHECK(Age >= 18),
Name VARCHAR(50) NOT NULL);
```

Assume that only one record has already been inserted using the following statement:

INSERT INTO Student `(StudentID = 'S001', NIC = '200012345678', Age = 20, Name = 'Saman');`

Which of the following subsequent insertions violates **only** two constraints?

(1) INSERT INTO Student ('S002', '200012345678', 20, 'Amal');
(2) INSERT INTO Student (NULL, '200012345678', 16, 'Nimal');
(3) INSERT INTO Student ('S004', '200078945612', 20, NULL);
(4) INSERT INTO Student ('S003', '200078945612', 17, 'Sunil');
(5) INSERT INTO Student (NULL, '200012345678', 20, 'Kamal');

30. Consider the following EMPLOYEE table:

EmpID	Name	Salary	DeptID
E01	Kasun	85 000	D01
E02	Dilini	72 000	D02
E03	Ruwan	75 000	D01
E04	Amaya	68 000	D03

What will be the output of the following SQL query?

```
SELECT  Name,  Salary
FROM  EMPLOYEE
WHERE  DeptID = 'D01' AND Salary > 80000;
```

(1)

Name	Salary
Kasun	85 000

(2)

Name	Salary
Ruwan	75 000

(3)

Name	Salary
Kasun	85 000
Ruwan	75 000

(4)

Name	Salary
Kasun	85 000
Dilini	72 000
Ruwan	75 000

(5)

Name	Salary
Kasun	85 000
Ruwan	75 000
Amaya	68 000

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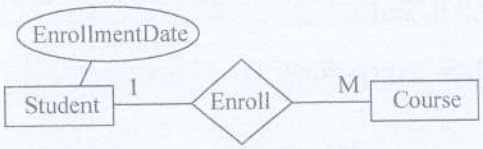
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31. A university maintains information about students and courses adhering to the following requirements.

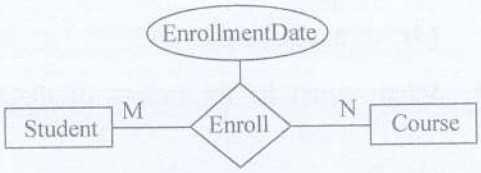
- A student may enroll in many courses.
- A course may have many enrolled students.
- The date of each student–course enrollment must be recorded.

Which of the following correctly represents all of these requirements?

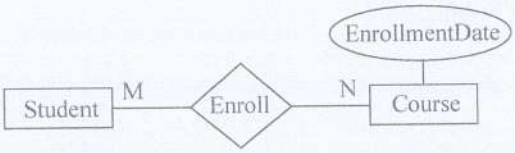
(1)



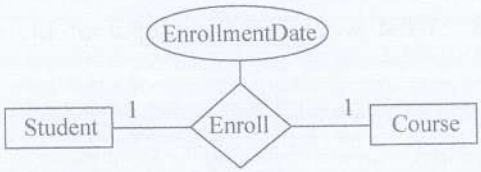
(2)



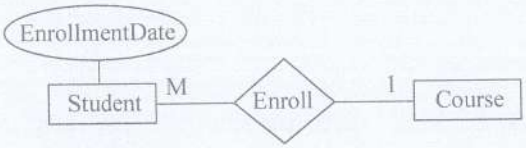
(3)



(4)



(5)



32. Consider the following relation:

`ORDER_DETAIL(OrderID, ProductID, CustomerID, CustomerName, ProductName, Quantity)`

Which dependency violates Second Normal Form (2NF)?

(1) (OrderID, ProductID) → Quantity
(2) OrderID → CustomerID
(3) (OrderID, ProductID) → Quantity
(4) CustomerID → CustomerName
(5) (OrderID, ProductID) → CustomerName

33. Match the **Normal Forms** labelled 0 to 3 with the corresponding **Descriptions** labelled A to D.

Normal Form
0 – 0NF
1 – 1NF
2 – 2NF
3 – 3NF

Description
A – No transitive dependencies.
B – All attributes are atomic.
C – No partial dependencies on the primary key.
D – Have repeating records.

(1) 0 – D, 1 – B, 2 – C, 3 – A
(2) 0 – B, 1 – D, 2 – C, 3 – A
(3) 0 – D, 1 – C, 2 – B, 3 – A
(4) 0 – A, 1 – B, 2 – D, 3 – C
(5) 0 – D, 1 – B, 2 – A, 3 – C

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34. Which of the following statement(s) correctly describe(s) the function of a software tool used in program development?

A : Assembler → Converts object code into assembly language and produces an executable file
B : Linker → Combines object files and library routines into a single executable program
C : Loader → Executes a program, line by line during translation

(1) A only (2) B only (3) A and B only
(4) A and C only (5) All A, B and C

35. What would be the output of the following Python expression?

```
print (5 + 2 * 3 ** 2 // 5 <= 8)
```

(1) 0 (2) 1 (3) 7 (4) True (5) False

36. What would be the output of the following Python code?

```
x = 2
y = 0
for i in range(1, 3):
    j = i
    while j > 0:
        y += x
        j -= 2
    x += 1
print(x, y)
```

(1) 3 5 (2) 4 4 (3) 4 5 (4) 4 6 (5) 5 9

37. What would be the output of the following Python code?

```
def update(quantities):
    quantities[1] = 50

def restock(quantities):
    for i in range(2):
        quantities[i] += 10

stock = [5, 10, 15]
update(stock)
restock(stock)
print(stock)
```

(1) [5, 50, 15]
(2) [15, 20, 25]
(3) [15, 60, 15]
(4) [15, 60, 25]
(5) Errors occur during execution

38. What would be the output of the following Python code?

```
student = ("Saman", 17, 20)
record = {"ICT": student[2],"Age": student[1],"Name": student[0]}
record["ICT"] += 50
mark_list = [record["Name"],record["ICT"]]
new_list = mark_list.copy()
new_list.clear()
new_list.append(100)
print(mark_list, new_list)
```

(1) ['Saman', 70] [100]
(2) ['Saman', 67] [100]
(3) ['Saman', 20] []
(4) [] [100]
(5) ['Saman', 70] ['Saman', 70, 100]

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39. Correctly match the given **Python Variable Values** labelled A to D to the correct **Data Structures** labelled 1 to 4.

Label	Python Variable Value
A	"My Name"
B	[10, 20, 30]
C	(10, 20, 30)
D	{"B": 85, "A": 90}

Label	Data Structure
1	List
2	Dictionary
3	Tuple
4	String

(1) A – 1, B – 4, C – 3, D – 2
(2) A – 2, B – 1, C – 3, D – 4
(3) A – 4, B – 3, C – 1, D – 2
(4) A – 4, B – 1, C – 3, D – 2
(5) A – 4, B – 1, C – 2, D – 3

40. Consider the following pseudocode:

```
START
    n:= 5
    REPEAT
        PRINT n
        n:= n - 2
    UNTIL n < 1
STOP
```

Which of the following Python code correctly represents the above pseudocode?

(1)
```
n = 5
while n < 1:
    print(n)
    n -= 2
```

(2)
```
n = 5
while True:
  print(n)
  n -= 2
  if n > 1:
    break
```

(3)
```
n = 5
while n >= 1:
    n -= 2
    print(n)
```

(4)
```
n = 5
for i in range(5):
    print(i)
```

(5)
```
n = 5
while n >= 1:
    print(n)
    n -= 2
```

41. A software development company is designing websites for four clients.

Client	Requirement
P	Allow customers to view restaurant menu items and location details.
Q	Allow customers to purchase products online using credit cards.
R	Allow display of daily weather forecasts to interested users.
S	Allow university students to check examination results after logging in.

Which of the above websites must implement both secure user authentication and encrypted communication as primary requirements?

(1) P and Q only (2) P and S only (3) Q and R only
(4) Q and S only (5) R and S only

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42. Match each HTML code segment with its functionality.

Code Segment

A : `<a href="gallery/photos.html">Gallery</a>`
B : `<a href="../index.html">Home</a>`
C : `<a href="https://www.nie.ac.lk">NIE</a>`
D : `<a href="#services">Services</a>`

Functionality

1. Creates a hyperlink to another section of the same webpage.
2. Creates a hyperlink to a webpage in a parent directory.
3. Creates a hyperlink to a webpage in a subdirectory.
4. Creates a hyperlink to an external website.

Which of the following is correct?

(1) A → 3, B → 2, C → 4, D → 1 (2) A → 2, B → 3, C → 4, D → 1
(3) A → 3, B → 4, C → 2, D → 1 (4) A → 4, B → 2, C → 3, D → 1
(5) A → 3, B → 1, C → 4, D → 2

43. Consider the following HTML code segment.

```
<p class="notice">Examination begins tomorrow.</p>
```

Which of the following CSS selector correctly applies styles only to the above paragraph?

(1) #notice (2) .notice (3) notice (4) p#notice (5) *notice

44. Consider the following HTML and CSS code segments, and statements A, B, and C about the resulting web page.

`<h1 id="heading">University</h1>`
`<p class="text">Faculty of IT</p>`
`<p id="special" class="text">`
`Department</p>`
	`#heading{color:red;}`
	`.text{color:green;font-weight:bold;}`
	`p{color:blue;}`
	`#special{color:purple;}`

A – The heading "University" appears in red.
B – The text "Faculty of IT" appears in green and bold.
C – The text "Department" appears in purple and bold.

Which of the above statement(s) is/are correct?

(1) A only (2) A and B only (3) A and C only
(4) B and C only (5) All A, B and C

45. Consider the following HTML code segment:

```
<!DOCTYPE html>
<html>
<body>
<dl>
   <dt>HTML</dt>
   <dd>HyperText Markup Language</dd>
</dl>
<body>
<html>
```

What would be the output displayed in the web browser?

(1) HTML
HyperText Markup Language

(2) 1. HTML
1. HyperText Markup Language

(3) • HTML
• HyperText Markup Language

(4) • HTML
1. HyperText Markup Language

(5) 1. HTML
• HyperText Markup Language

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46. Consider the following PHP statement:

```
$conn = mysqli_connect("1", "2", "3", "4", "5",);
```

Which of the following correctly identifies the parameters in the order they are passed to the `mysqli_connect` function?

(1) 1 – Server Name, 2 – Password, 3 – Database Name, 4 – Username
(2) 1 – Server Name, 2 – Username, 3 – Database Name, 4 – Password
(3) 1 – Database Name, 2 – Username, 3 – Password, 4 – Server Name
(4) 1 – Username, 2 – Password, 3 – Database Name, 4 – Server Name
(5) 1 – Server Name, 2 – Username, 3 – Password, 4 – Database Name

47. A microcontroller-based development board is used to build an embedded system. Correctly match the **Components**, labelled from A1–A3 with the **Board features** labelled from B1–B3:

Label	Component
A1	LDR
A2	LED
A3	Reed switch on a door

Label	Board feature
B1	Analog input
B2	Digital input
B3	Digital output

(1) A1 – B1, A2 – B2, A3 – B3
(2) A1 – B1, A2 – B3, A3 – B2
(3) A1 – B2, A2 – B3, A3 – B1
(4) A1 – B2, A2 – B1, A3 – B3
(5) A1 – B3, A2 – B1, A3 – B2

48. Which of the following regarding embedded systems and IoT is correct?

(1) A piezo buzzer can be used as an actuator in an IoT application.
(2) A reed switch can be used both as a sensor and an actuator in an IoT application.
(3) An ethernet shield connected to an Arduino Uno communicates with it via the analog pins A1 to A4.
(4) An LDR is a type of diode which changes its resistance based on the intensity of light falling on it.
(5) A microprocessor is a single chip containing a CPU, memory, I/O ports, and other peripherals.

49. In regular computers, data is stored as bits that can only be either 0 or 1. Quantum computers use 'qubits' instead. What makes a qubit different and unique compared to a regular bit?

(1) A qubit is physically much larger and heavier, allowing it to store massive files like movies faster.
(2) As qubit operates without using any electricity, Quantum Computers do not need an electrical power supply.
(3) A qubit can exist in a state called superposition, that means it can represent 0, 1, or a combination of both at the same time.
(4) A qubit automatically deletes any viruses on the computer before they execute.
(5) A qubit can physically change the colour of the computer display screen based on the user's mood.

50. In a multi-agent system, which of the following explains a key feature of how these agents operate?

(1) They all share one single central computer that tells every agent exactly what to do at every microsecond.
(2) They are not allowed to talk to each other and will automatically shut down if they detect another agent nearby.
(3) Each agent makes its own independent decisions based on what it can sense around it, and they communicate with each other as necessary.
(4) They can work only if a human manager manually types in commands for every single step they take.
(5) They are designed to physically take over the user's keyboard and mouse during an emergency.

* * *

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ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2026
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2026
General Certificate of Education (Adv. Level) Examination, 2026

තොරතුරු හා සන්නිවේදන තාක්ෂණය II
தகவல், தொடர்பாடல் தொழினுட்பவியல் II
Information & Communication Technology II

20 E II

පැය තුනයි
மூன்று மணித்தியாலம்
Three hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
மேலதிக வாசிப்பு நேரம் - 10 நிமிடங்கள்
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions you will answer and decide which of them you will prioritise.

Index No. : .....

Important:

- *This question paper consists of* **14** *pages.*
- *This question paper comprises of two parts,* **Part A** *and* **Part B**. *The time allotted for* ***both parts*** *is* ***three hours***.
- *Use of calculators is* ***not allowed***.

PART A — Structured Essay:
(pages 2 - 8)

- *Answer* ***all*** *the questions* ***on this paper itself***. *Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and that extensive answers are not expected.*

PART B — Essay:
(pages 9 - 14)

- *This part contains* ***six*** *questions, of which,* ***four*** *are to be answered. Use the papers supplied for this purpose.*
- *At the end of the time allotted for this paper, tie the* ***two parts together*** *so that* **Part A** *is* ***on top*** *of* **Part B** *before handing them over to the Supervisor.*
- *You are permitted to remove* ***only*** **Part B** *of the question paper from the Examination Hall.*

For Examiners' Use Only

For the Second Paper		
Part	**Question No.**	**Marks**
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9	
	10	
Total		

Final Marks

In numbers	
In words	

Code Number

Marking Examiner 1	
Marking Examiner 2	
Marks checked by :	
Supervised by :	

[see page two

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Part A – Structured Essay

*Answer **all four** questions on this **paper itself**.*

Do not write in this column

1. (*a*) A Book lending form used in a Library Management System is illustrated in Figure 1.1. The corresponding HTML and CSS source code is shown in Figure 1.2.

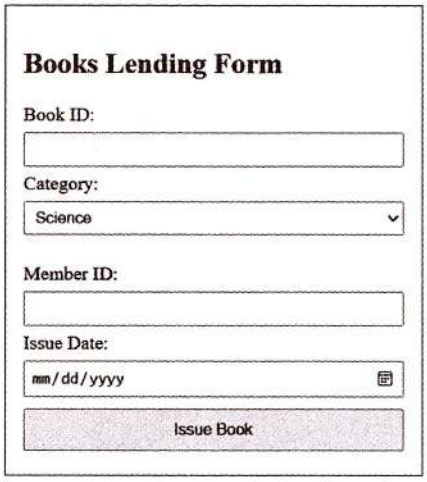


Figure 1.1: The Book lending form

(i) The code segment with blanks labelled ❶ to ❽ is shown in Figure 1.2 below.

```
<html>
<head>
<style>
   form {width:320px; padding:15px; border:1px solid black; margin-left:20px;}
   input, select {width: 100%; margin: 5px 0; padding: 5px;}
   input[type=radio] {width:  auto;}
   input[type=submit] {
     background-color blue; padding: 8px;}
</style>
</head>

<body>
<form ❶="./issue_book.php" ❷="post">
   <h2>Books  Lending  Form</h2>
   <❸ for="bookid">Book ID:</❸>
            <input type="❹" name="bookid" id="bookid">
   <❸ for="category">Category:</❸>
            <❺ name="category" id="category">
                  <❻ value="science">Science</❻>
                  <❻ value="ict">ICT</❻>
            </❺> <br> <br>

   <❸ for="memberid">Member ID:</❸>
            <input type="❹" name="memberid">

   <❸ for="date">Issue Date:</❸>
            <input type="❼" name="date" required><br>
   <input type="❽" value="Issue Book">
</form>
</body>
</html>
```

Figure 1.2: HTML and CSS source code generated for Figure 1.1

[*see page three*

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Do not write in this column

For each labelled blank, select the most appropriate HTML keyword from the list of options labelled A – O, and write down the option label in the answer table provided. (04 *marks*)

List of options:

A. text	B. value	C. label	D. image	E. action
F. select	G. submit	H. method	I. option	J. img src
K. number	L. a	M. input	N. reset	O. date

Answer table:

❶	❷	❸	❹
❺	❻	❼	❽

(ii) What is the syntax error in the CSS code in Figure 1.2 above, and how should it be corrected?

.....

(0.5 *marks*)

(iii) Explain how this error you identified in (ii) above affects the display of the relevant HTML element in the web browser.

.....

(0.5 *marks*)

(*b*) The issue_book.php script is executed when the form in Part (a) above is submitted. After submission, the system must display the **Book ID** and **Issue Date** entered by the user.

```
<?php
$var1 = $_POST["..... ❶ ....."];
$var2 = $_POST["..... ❷ ....."];

echo "Book ID: " . ..... ❸ .....; echo "<br>";
echo "Issue Date: " . ..... ❹ .....;
?>
```

Write your answers in the table below to complete the blanks labelled ❶ – ❹ in the PHP code segment above.

❶	❷
❸	❹

(02 *marks*)

(*c*) Consider the following HTML code segment.

```
<html>
<body>
<h2>Library Book Records</h2>
<table border="1">
<tr><th>Book ID</th><th>Category</th><th>Title</th><th>Status</th></tr>
<tr><td>B101</td><td rowspan="2">Science</td><td>Mechanics</td><td>Available</td></tr>
<tr><td>B102</td><td>Chemistry Basics</td><td>Borrowed</td></tr>
<tr><td>B103</td><td rowspan="2">ICT</td><td>Web Design</td><td>Available</td></tr>
<tr><td>B104</td><td>Programming  Basics</td><td>Borrowed</td></tr>
</table>
</body>
</html>
```

[see page four

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(i) Draw the expected output of the above HTML code when rendered by a web browser. Consider the following dotted line box as the display area of the browser.

(02 *marks*)

Do not write in this column

(ii) A new ICT book record needs to be added as the last row of the ICT category, after the B104 row:

- Book ID : B105
- Title : CSS Basics
- Status : Available

Write the HTML code to add this record as a new row under the ICT category, ensuring the table structure remains correct. Write down the additional changes required to keep the table structure correct.

.....

.....

(01 *mark*)

2. (*a*) A commercially available library management system **(LibMIS)** allows students to register as library users through an online registration page. Once submitted, the provided information is automatically validated by LibMIS using the student details in the central school database, and user account is created.

The existing library system used in your school **(SchoolLIB)** only permits the librarian to register students, by creating user accounts through an administrator page. For this, details of a student are to be input after manually verifying the respective paper-based student personal record.

In both systems, the user is notified about the result of the user registration process through e-mail.

Using the above description, answer the following questions:

(i) Write down who initiates the user registration process in the following systems:

LibMIS – .....

SchoolLIB – ..... (01 *mark*)

(ii) In the current SchoolLIB user registration process, which specific task creates an operational bottleneck (an inefficiency) during peak registration periods?

.....

(01 *mark*)

(iii) In terms of how student details are verified, write down the main process gap in data verification between LibMIS's standard process and SchoolLIB's current practice.

.....

(01 *mark*)

[*see page five*

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(iv) Clearly state **one** specific modification, required to the SchoolLIB's User Registration business process in order to adapt to LibMIS's standard Online User Registration Page.
[Note: other than the change in data verification]

Do not write in this column

.....

(01 *mark*)

(v) Using the change identified in (iv) above, and the data verification gap identified in (iii), clearly state the reengineered business process of library user registration to align with LibMIS's current process.

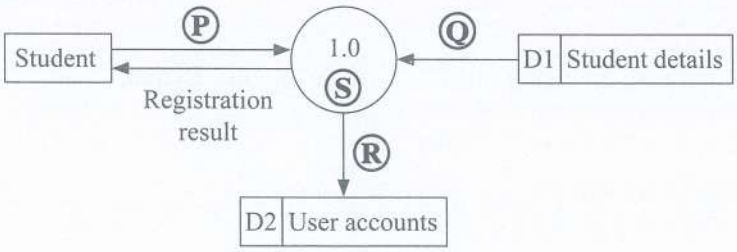
.....

.....

(01 *mark*)

(vi) Below is a partial Data Flow Diagram (DFD) fragment for the LibMIS registration process. Write down the most suitable replacements for labels Ⓟ, Ⓠ, Ⓡ, Ⓢ from the list given below.

List: {Book details, Register user, Registration details, Student details, User account details, Librarian}



Ⓟ : ....., Ⓠ .....,

Ⓡ : ....., Ⓢ .....

(01 *mark*)

(vii) A software tester designs test cases for the registration module of LibMIS to identify valid and invalid ID formats, without knowledge of its internal implementation. Each test case is executed, and the output is checked for acceptance or rejection. Which testing technique does this represent? Explain your answer.

.....

.....

(02 *marks*)

(*b*) Write the most appropriate answer to fill the blanks in the statements given below:

(i) ..... (e.g. PayPal) type Secure Payment Mechanisms allow buyers to pay for e-commerce transactions without sharing their sensitive credit card details directly with individual merchants. (01 *mark*)

(ii) Applying online for a hard copy of your birth certificate from the government registry service and paying the required fee online is an example of ..... type e-business transaction. (01 *mark*)

[see page six

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Do not write in this column

3. (*a*) Consider the following Python program:

```
x = 0
found = False
n = int(input())

while n >= 0:
  found = True
  if n > x:
       x = n
  n = int(input())

if found:
  print(x)
else:
  print("No  positive  numbers  were  entered")
```

(i) Write the output of the program if the input sequence is 10, 5, 0, 15, 25, –1.

.....

(01 *mark*)

(ii) What is the purpose of this program?

.....

(01 *mark*)

(iii) What is the purpose of using `found` variable in this Python code?

.....

.....

(01 *mark*)

(*b*) Write down the replacements for the labels ❶ to ❻ of the following Python code which has been written to find the average of a set of integers terminated by a negative number.

```
total = ❶
count = 0
n = int(input())
while n >= 0:
        total = ❷
        count = ❸
        ❹
if ❺ > 0:
        average = ❻
        print(average)
else:
     print ("No positive numbers were entered")
```

❶ .....

❷ .....

❸ .....

❹ .....

❺ .....

❻ ..... (03 *marks*)

[*see page seven*

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(c) (i) The flowchart represents an algorithm to find the reverse of a given positive integer. For example, if the input number is 1234, the output should be 4321.

Write the most suitable statements for the labels ❶ to ❺ in the given flowchart.

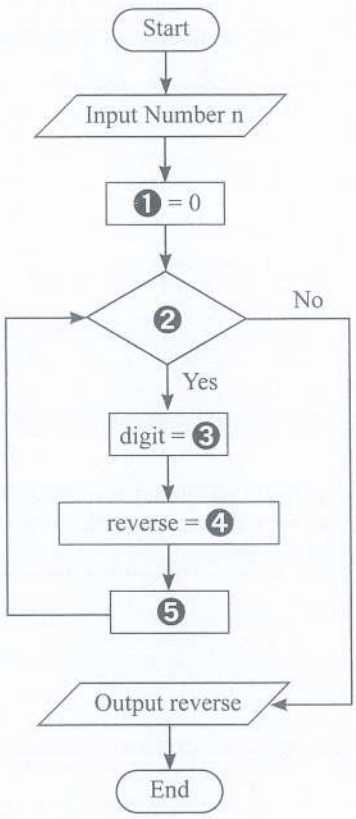
❶ .....

❷ .....

❸ .....

❹ .....

❺ ..... (02 *marks*)



(ii) Write a Python program to implement the completed algorithm in the flowchart using a while loop.

.....

.....

.....

.....

.....

.....

.....

..... (02 *marks*)

Do not write in this column

4. (a) A portion of File Allocation Table (FAT) for a storage device is shown below. The portion describes the complete blocks of three files (File 1, File 2, File 3). (Note: The last block of a file is indicated by –1.)

FAT	20	21	22	23	24	25	26	27	28
...	22	24	–1	28	25	–1	27	–1	26

(i) The directory entries for File 1 and File 2 are 20 and 21 respectively. Write down the block chains for each of the three files.

File Name	Block Chain
File 1	
File 2	
File 3	

(02 *marks*)

(ii) Calculate the total size occupied on disk by File 1 and File 3 combined, given the block size is 4 KB. Show your calculations.

.....

.....

.....

.....

(01 *mark*)

[*see page eight*

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(iii) A multimedia application stores very large video files that grow in size over time. It also needs fast random access to any part of the file. Between linked allocation and indexed allocation, state which allocation method is more suitable for this usecase. Justify your answer.

Do not write in this column

.....

.....

.....

.....

.....

.....

(02 *marks*)

(*b*) A computer runs three processes P_1, P_2, and P_3 in a multiprogramming environment. At a particular moment the Operating System (OS) performs a context switch from P_3 to P_2.

(i) Write down what data the OS saves and where, during this switch.

.....

.....

(01 *mark*)

(ii) Why is context switch time considered pure overhead?

.....

.....

(01 *mark*)

(*c*) A computer that uses 48-bit virtual addresses has 8 GB (2^{33} bytes) of physical memory and a 4 KB page size.

(i) Give the maximum possible size of the virtual address space for a process running on this computer in bytes as a power of 2.

.....

(0.5 *marks*)

(ii) How many bits are required to store the frame number in a page table entry of a process running on this computer?

.....

(0.5 *marks*)

(iii) The virtual address 8193 of a particular process running on this computer is mapped to Frame 2 of physical memory. Write down in decimal form the physical address corresponding to the virtual address 8193. (Assume that all page numbers, frame numbers and addresses begin from 0.)

.....

(01 *mark*)

(*d*) When a new printer is connected to a computer, the OS cannot communicate with it until a device driver is installed. Explain why.

.....

.....

.....

.....

.....

.....

(01 *mark*)

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இலங்கைப் பரீட்சைத் திணைக்களம் இலங்கைப் பரீட்சைத் திணைக்களம்
Department of Examinations, Sri Lanka Department of Examinations, Sri Lanka
ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව ශ්‍රී ලංකා විභාග දෙපාර්තමේන්තුව
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2026
கல்விப் பொதுத் தராதரப் பத்திர (உயர் தர)ப் பரீட்சை, 2026
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තොරතුරු හා සන්නිවේදන තාක්ෂණය	II
தகவல், தொடர்பாடல் தொழினுட்பவியல்	II
Information & Communication Technology	**II**

20 E II

Part B

* *Answer any four questions only.*

5. (*a*) State and prove De Morgan's theorems. (03 *marks*)

(*b*) Show that:

$$\bar{a}\bar{b}c + \bar{a}b\bar{c} + a\bar{b}\bar{c} + abc = \left(\bar{a}b + a\bar{b}\right)\bar{c} + \overline{\left(\bar{a}b + a\bar{b}\right)}c$$

by solving the left-hand side of the equation using Boolean algebra. (06 *marks*)

(*c*) The room containing a company's confidential documents is secured by a door controlled by a logic circuit. This logic circuit is equipped with two locks and a fingerprint scanner. The supervisor and a clerk each hold one key, with each key corresponding to one of the two locks. Under normal operation, the door opens only when both the supervisor's key and the clerk's key are inserted simultaneously. However, in the absence of the clerk, the supervisor is authorized to open the door by inserting his own key and providing his fingerprint at the same time. The circuit does not operate when all three inputs are provided simultaneously. Design a logic circuit, clearly showing all the necessary design steps, to implement this access control system using only NAND gates. State assumptions you make if any. (06 *marks*)

6. A company has three departments: Production, Marketing, and Human Resource Management, located in a multi-storey building. A Local Area Network (LAN) has been established to interconnect the devices in these three departments and provide Internet access.

Each department operates on a separate subnet with its own IP address range. The organisation uses the private IPv4 address space 192.168.0.0/16 and employs Network Address Translation (NAT) to enable internet access to the devices within the internal network.

The following IP address ranges have been allocated to the Production, Marketing, and Human Resource Management departments, respectively:

- Production: 192.168.0.0/17
- Marketing: 192.168.128.0/19
- Human Resource Management: 192.168.160.0/19

The company plans to establish two additional departments–Accounting and Information Technology (IT)–in two separate newly constructed buildings. Both of these departments need to be connected to the company's existing network and provided with Internet access.

(*a*) Write **one** purpose of using NAT. (02 *marks*)

(*b*) Write the total number of addresses available in the private address space 192.168.0.0/16.(02 *marks*)

(*c*) If the company decides to divide the remaining available IP address space equally between the two new departments, determine the network address in the form of xxx.xxx.xxx.xxx/yy, subnet mask, usable address range, and the broadcast address of each of the five departments. You must use the following format to structure your answer:

Department	Network address	Subnet mask	Usable address range	Broadcast address
Production				
Marketing				
Human Resource Management				
Accounting				
Information Technology				

(05 *marks*)

[*see page ten*

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(*d*) Suggest suitable communication media that can be used to connect the newly established departments to the existing LAN. (02 *marks*)

(*e*) The company decides to install a firewall to protect the network. Identify the correct location in the network, where the firewall should be installed. Justify your answer. (04 *marks*)

7. (*a*) Kavindi has built a motion-sensing light using an Arduino UNO board, a PIR (Passive Infrared) sensor, an LED, and a resistor, connected as shown in **Figure 7.1**. The PIR sensor with VCC, OUT and GND pins, is shown in the top-right of the figure. It detects motion by measuring changes in infrared radiation emitted by objects in its field of view. When a warm body such as a person or animal moves within range, the sensor outputs a HIGH signal on its OUT pin.

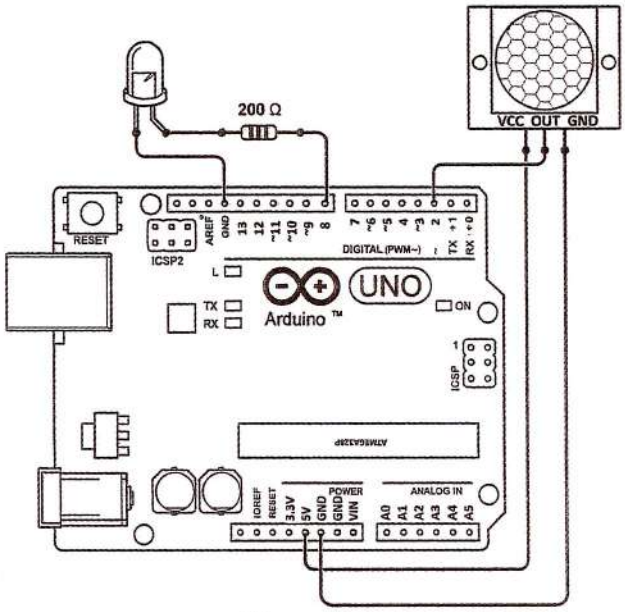


Figure 7.1

(i) The Arduino code Kavindi wrote to operate this circuit is shown below. However, some parts of the code have been left incomplete. Write down the correct entries for the blanks labelled Ⓐ, Ⓑ, Ⓒ and Ⓓ. (04 *marks*)

```
const int pirPin = Ⓐ;
const int ledPin = 8;

void setup() {
  pinMode(pirPin, Ⓑ);
  pinMode(ledPin, OUTPUT);
}
void loop() {
  int motion = digitalRead(pirPin);

  if (motion == Ⓒ) {
     digitalWrite(ledPin, Ⓓ);
     delay(10000);
     digitalWrite(ledPin, LOW);
  }
}
```

(ii) She connected a piezo buzzer to digital pin 9 of the Arduino and wants the buzzer to sound whenever a motion is detected, at the same time as the LED turns on. Modify the code inside `loop()` to add this feature. (02 *marks*)

(iii) Kavindi notices the LED also turns on during the day when a motion is detected, which is unnecessary. Suggest a sensor that could be added to the circuit so that the LED only turns on when the motion is detected at night, and suggest an Arduino pin it should be connected to. (02 *marks*)

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(*b*) A software engineering company uses a Multi-Agent System (MAS) to automate the system development lifecycle activities to produce software systems. Instead of using human software engineers as the project team, four software agents are introduced as follows:

1. Requirements Analysis Agent (RAA)
2. System Design Agent (SDA)
3. Implementation and Testing Agent (ITA)
4. Deployment and Maintenance Agent (DMA)

The company selected a client project to evaluate whether the MAS can successfully complete a realistic development project. After analyzing the requirements of this project, the company decides to follow the waterfall model for its development.

(i) Draw a suitable diagram showing the client and the MAS executing the software development process activities. (Clearly indicate each agent, their interactions, and any other related information in your diagram.) (02 *marks*)

(ii) Identify an interface agent in this setup. (01 *mark*)

(iii) Among the SDA and ITA, which agent demonstrates lower level of self-autonomy when trying to achieve its task objectives. (01 *mark*)

(*c*) (i) Explain the difference between how a classical computer bit and a quantum computer qubit represent data values. (01 *mark*)

(ii) Based on your answer to (i) above, explain why the processing capabilities of quantum computers present a major security challenge to widely used data-privacy mechanisms such as public-key encryption. (02 *marks*)

8. (*a*) A university plans to develop a database to manage lecturers, research projects, and funding agencies.

- Each research project is assigned a unique identification number [ProjectID]. Details such as the project title [Title], research area [Area], and the year in which the project commenced [Year] are maintained.
- Each lecturer is assigned a unique identification number [LectureID], and details such as the lecturer's name [LName], department [Department], email address [Email], and telephone number [TelNumber] are stored in the database. The lecturer's name is recorded as a composite attribute consisting of [FirstName], [MiddleName], and [LastName].
- A project may involve several lecturers, while an individual lecturer may contribute to multiple research projects simultaneously.
- For each lecturer involved in a project, the university records their role [Role] such as Principal Investigator, Co-investigator, or Research Assistant, and the date joined [JoinedDate].
- Research projects receive funding from external funding agencies. Each funding agency is uniquely identified by an identification number [AgencyID]. The university stores the agency name [AName], and country [Country].
- A funding agency may sponsor many research projects, but each research project is sponsored by only one funding agency.

(i) Draw the ER Diagram for above given scenario showing the entities, attributes, relationships and appropriate cardinalities for each relationship. Underline the primary key attributes.

[**Note**: Use only the terms given within square brackets in the above description for the entities, attributes and relationships.] (04 *marks*)

(ii) Write the relation schema for the above ER diagram.

[**Note**: List the tables only with the given attribute names. Underline the primary keys. Draw an arrow from each foreign key to the table it references with the arrowhead pointing to the primary key of the referenced table.] (04 *marks*)

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(*b*) A school maintains records of student participation in extra-curricular clubs using a single table as given below.

CLUB_MEMBERSHIP(StudentID, ClubID, AdvisorID, StudentName, ClubName, AdvisorName, JoiningDate)

The following business rules apply:

- A student may join several clubs, and a club may have many student members.
- Each club is supervised by one advisor.
- The combination (StudentID, ClubID) uniquely identifies a membership record.

(i) Identify **two** partial dependencies present in this table. (02 *marks*)

(ii) Identify **one** transitive dependency present in this table. (01 *mark*)

(iii) Decompose the table into a set of tables that satisfy the Third Normal Form (3NF). List each table with their attributes. Underline the primary key. (04 *marks*)

9. A public library in a city wants to keep records of books returned late by its members. Each library member has a unique membership number. Examples are "M001", "M002", "M003".

For each late book return, the library records two details:

1. The membership number of the member (e.g.: "M001")
2. The number of days overdue

Each record is stored as a Python tuple in the following format: (memberNo, lateDays)
e.g.: ("M002", 5) means that member "M002" returned a book 5 days late.

All late return records are stored in a Python list named lateReturns.
e.g.: `lateReturns = [("M001", 1), ("M002", 5), ("M003", 10)]`

The library calculates the fine for each member according to the following rules:

Number of late days	Fine Status/Details
0 – 5 days	No Fine
6 – 10 days	Rs. 10 per day after the first 5 days
More than 10 days	Rs. 10 per day for the first 5 days and Rs. 25 per day for remaining days
Maximum fine: Rs. 500	

For example, if lateDays = 12, the fine is: $(5 \times 10) + (7 \times 25) = 225$.

(*a*) Write a Python function named ***calculateFine(lateDays)*** to return the fine according to the above rules. (05 *marks*)

(*b*) Given the following list (lateReturns), write Python code to create a new list named ***fineList*** containing only members who must pay a fine. Each item in ***fineList*** should be a tuple in the format (memberNo, fine).

```
lateReturns = [("M001", 1), ("M002", 5), ("M003", 10), ("M004", 20), ("M005", 30)]
```

(04 *marks*)

(*c*) Write a Python function named ***searchFine(fineList, memberNo)*** to search the fine of a given member using sequential search. The function should return the fine amount if the member is found; otherwise, it should return –1. (04 *marks*)

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(*d*) Write the output of the following Python code.

```
print(calculateFine(4))
print(calculateFine(7))
print(calculateFine(15))
print(searchFine([("M002", 30), ("M003", 125), ("M005", 500)], "M003"))
```

(02 *marks*)

10. (*a*) Consider the following scenario and answer the questions.

The ICT society of ABC School conducts seminars, workshops, competitions, and guest lectures throughout the year. Currently, student registrations are handled manually, using printed forms. This has caused duplicate registrations, incorrect participant counts, and delays in preparing attendance lists.

To address these issues, the school hired a software development company to develop a Web-based Event Registration System that supports the following requirements:

- Students should be able to view available events through the online system.
- Students should provide their Admission Number, Name, and Email address when registering for an event.
- The system should check existing registrations before accepting a new registration request.
- The system should provide confirmation after a successful registration.
- The system should be accessible at any time from different locations.
- Administrators should be able to view event registration details and participant counts.

(i) Write down **one** functional requirement and **one** non-functional requirement from the given requirements using the exact wording provided. (02 *marks*)

(ii) The software company selected the Waterfall model for developing the system. After the coding of most modules had been completed, the school requested two additional features that were not included in the original requirements: an automated email reminder before each event and a feedback form after an event.

(1) Explain **one** limitation of the Waterfall model demonstrated in this scenario. (01 *mark*)

(2) Suggest a suitable process model for this project and give a reason for your choice. (02 *marks*)

(*b*) A school uses a Web-based Event Registration System to manage student registrations for school events. The system was implemented using the following webpages.

Webpage	Function
index.html	Allows students to enter their StudentID
events.php	Displays available events
register.php	Processes event registration

A student first enters their StudentID in index.html. The request is then sent to events.php to display available events. The system uses the following two database tables:

- EVENT(EventID, EventName, EventDate)
- REGISTRATION(RegistrationID, StudentID, EventID, RegistrationDate)

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Refer to Figure 10.1 and Figure 10.2 and answer the following questions.

```
<?php
$conn = mysqli_connect("localhost", "root",
"UnI223@5", "SchoolDB");
$studentID = $_POST["studentID"];

$sql = "SELECT * FROM EVENT";
$result = mysqli_query($conn, $sql);

while ($row = mysqli_fetch_assoc($result)) {
?>
<form method="POST" action="register.php">
    <input type="hidden" name="studentID" val-
ue="<?php echo $studentID; ?>">
    <input type="hidden" name="eventID" val-
ue="<?php echo $row["EventID"]; ?>">
    <?php echo $row["EventName"]; ?>
    <input type="submit" value="Register">
</form>
<?php
}
?>
```

Figure 10.1: Code Segment of events.php

```
<?php
$conn = mysqli_connect("localhost", "root",
"UnI223@5", "SchoolDB");
$studentID = $_POST["studentID"];
$eventID   = $_POST["eventID"];

$sql = ". . . . . .Ⓐ . . . . . .
. . . . . .";
mysqli_query($conn, $sql);

echo "Registration Successful";
?>
```

Figure 10.2: Code Segment of register.php

(i) What is stored in the variable `$result` after executing the following statement in events.php? (01 *mark*)

```
$result = mysqli_query($conn, $sql);
```

(ii) Modify the SQL statement in events.php to retrieve only EventID and EventName from the EVENT table. (02 *marks*)

(iii) Explain the purpose of the hidden input fields (StudentID and eventID) used in events.php. (02 *marks*)

(iv) Write the SQL statement required to replace blank Ⓐ in register.php to insert a new registration record into the REGISTRATION table using StudentID, EventID, and RegistrationDate. Assume that RegistrationID is automatically generated. (02 *marks*)

(c) (i) Compare the main difference between **Direct Deployment** and **Parallel Deployment** in terms of cost and operational risk. (01 *mark*)

(ii) XYZ bank is replacing its main systems and the databases following Direct Deployment method. Do you recommend this deployment? Explain your reasoning. (02 *marks*)

* * *

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