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බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
மேல் மாகாணக் கல்வித் திணைக்களம்
Department of Education - Western Province

තෙවන වාර පරීක්ෂණය
மூன்றாம் தவணைப் பரீட்சை - 2026
Third Term Test

ශ්‍රේණිය }
தரம் } 13
Grade }

විෂයය }
பாடம் } Information &
Subject } Communication Technology

පත්‍රය }
வினாத்தாள் } I
Paper }

පැය }
மணித்தியாலம் } 2
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 (X) in accordance with the instructions given on the back of the answer sheet.
- * Use of calculators is **not allowed**.

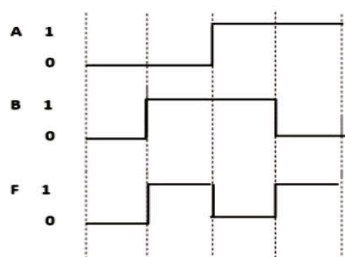
- Which of the following statements regarding data validation checks is true?
 - (1) Data type check is used to check the length of a text field.
 - (2) Range check is commonly performed on non-numeric data.
 - (3) A presence check ensures that a field is not left blank.
 - (4) It is considered a key step in the data life cycle.
 - (5) Data validation checks are not necessary to maintain data integrity.
- What is the computing method where multiple tasks are processed simultaneously using multiple processors?
 - (1) Grid Computing
 - (2) Cloud Computing
 - (3) Distance Computing
 - (4) Mobile Communication
 - (5) Parallel Computing
- Which of the following is the correct statement about firmware?
 - (1) It can run without any hardware device.
 - (2) It stores essential data in the computer's main memory.
 - (3) It is stored in secondary storage.
 - (4) It can only be found on computers
 - (5) It is essential for the computer's booting process.
- Which of the following statements is **incorrect**?
 - (1) Microprocessors were introduced in the third-generation computers.
 - (2) Magnetic drums were used as memory in the first-generation computers.
 - (3) Assembly language was introduced in the second generation.
 - (4) Integrated circuits reduced size and increased reliability.
 - (5) Very Large-Scale Integration technology was used in the fourth-generation computers.
- Consider the following statements about Von Neumann architecture:

A - Instructions and data are stored in the same memory.
B - It uses separate buses for instructions and data.
C - Execution of instructions follows a sequential order.

Which of the above 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

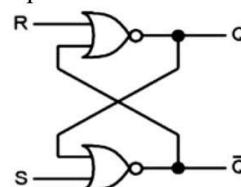
6. Which of the following is **not** a characteristic of Synchronous Dynamic Random Access Memory (SDRAM)?
- (1) It stores data in flip-flops instead of capacitors.
 - (2) It is synchronized with the system clock.
 - (3) It requires periodic data refresh.
 - (4) It is faster than conventional DRAM.
 - (5) It is suitable for main memory.
7. Which of the following representations are equivalent to the binary number 10111101.110_2 ?
- A. 189.75 B. 275.3_8 C. $BD.C_{16}$
- (1) A only
 - (2) B only
 - (3) A and C only
 - (4) B and C only
 - (5) All A,B and C
8. When performing a bitwise operation on two binary numbers, the answer was 1110110 . Which of the following answers is the correct bitwise operation?
- (1) $110110 \text{ AND } 1010001$
 - (2) $1000110 \text{ XOR } 1010010$
 - (3) $10010110 \text{ AND } 1010011$
 - (4) $1011010 \text{ OR } 1011110$
 - (5) $1110110 \text{ OR } 1010000$
9. Consider the following statements about character encoding systems:
- A - ASCII is compatible with modern encodings.
 B - ASCII contains more characters than EBCDIC.
 C - BCD is commonly used in digital systems such as digital clocks and calculators.
- Which of the above are correct?
- (1) A only
 - (2) A and C only
 - (3) B only
 - (4) B and C only
 - (5) A and B only
10. The sum of -74 and $+108$ in 8-bit 2's complement is,
- (1) 10000010
 - (2) 00100010
 - (3) 11111110
 - (4) 11011010
 - (5) 01011010
11. Below is a timing diagram of a logic circuit with inputs A and B and output F. Which of the following logic expressions produces the same output as F?



- (1) $F = \overline{AB} + A\overline{B}$
- (2) $F = \overline{AB} \cdot \overline{AB}$
- (3) $F = (\overline{A + B}) \cdot \overline{A + B}$
- (4) $F = (\overline{A + B}) \cdot (A + \overline{B})$
- (5) $F = (\overline{A} \cdot \overline{B})(\overline{AB})$

12. Consider the following SR latch circuit designed using NOR gates. What are the expected values of a, b, c and d according to the values given in the table below for the S and R inputs of the circuit?.

S	R	Q	$\overline{Q}$
1	0	a	b
0	0	c	d



- (1) $a=1, b=0; c=1, d=0$
- (2) $a=1, b=0; c=0, d=1$
- (3) $a=0, b=0; c=0, d=1$
- (4) $a=1, b=1; c=1, d=1$
- (5) $a=0, b=1; c=1, d=1$

13. Which sequence of operating system generations is correct with respect to historical evolution of Operating Systems (OS)?
- (1) Batch → Real-Time → Time-Sharing → Distributed
 - (2) No OS → Batch → Time-Sharing → Multi-programmed Batch
 - (3) Single-User → Multi-User → Network → Cloud
 - (4) Batch → No OS → Time-Sharing → Multi-programmed Batch
 - (5) No OS → Batch → Multi-programmed Batch → Time-Sharing
14. Consider the following statements related to operating systems.
- A - High throughput, high turnaround time, and low response time increase the efficiency of a system.
 - B - In non-preemptive scheduling, running → ready transition is not possible.
 - C - The long-term scheduler decides which processes in memory are to be executed.
 - D - The mid-term scheduler temporarily removes processes from main memory and places them on secondary memory or vice versa.
- Which of the above are correct?
- (1) A and D only
 - (2) A, B and C only
 - (3) B, C and D only
 - (4) B and D only
 - (5) A, C and D only
15. In a multitasking environment, several applications send print jobs simultaneously. The OS uses a device driver to handle this. What is the device driver's role in this situation?
- (1) It stores all print jobs permanently, allowing access to the printer.
 - (2) It directly executes application code.
 - (3) It replaces the need for print spooling.
 - (4) It helps coordinate communication between the OS and the printer.
 - (5) It increases the printer's hardware speed while sharing with several applications.
16. Consider the following statements about IPv4 address subnetting:
- A - Class C network can have 3 subnets of 64 hosts each.
 - B - Subnet mask of the IP address 125.54.2.100/20 is 255.255.240.0
 - C - Class C network can have 6 subnets of 30 hosts each.
 - D - The network address of the host IP address 10.16.3.65/23 is 10.16.3.0.
- Which of the above are true?
- (1) C and D only
 - (2) B and C only
 - (3) A and C only
 - (4) A, B and D only
 - (5) B, C and D only
17. Which of the following is correct about Media Access Control protocols?
- (1) In Pure ALOHA, devices transmit only at the beginning of fixed time intervals to avoid collisions.
 - (2) Slotted ALOHA allows a device to send data immediately without waiting for any specific transmission period.
 - (3) In CSMA/CD, devices transmit data without checking whether the communication channel is busy or idle.
 - (4) CSMA/CD is mainly designed for wireless communication systems where collision detection is impossible.
 - (5) Slotted ALOHA reduces the probability of collisions by allowing transmissions only at synchronized intervals.

18. Alice sends the word "NETWORK" from her computer to Bob using a TCP connection, letter by letter as separate packets. Due to network delays, the packets arrive at Bob in this order: N → T → E → W → O → R → K.

Which of the following is correct regarding the above delivery?

- (1) TCP delivers letters immediately as they arrive, so Bob sees "NETWORK."
- (2) TCP discards out-of-order letters and requests retransmission for missing ones.
- (3) TCP reorders them according to sequence numbers before delivering them to Bob.
- (4) TCP merges the letters randomly and sends an acknowledgment for the entire word.
- (5) TCP sends the letters to UDP for faster delivery and ordering.

19. A student downloads a "free game" from an unknown website. The game installs successfully and appears to work normally. However, in the background, it secretly collects personal data and sends it to an attacker.

Which type of malware is described in the scenario?

- (1) Virus
- (2) Trojan Horse
- (3) Worm
- (4) Adware
- (5) Ransomware

20. Consider the following IP address:

172.18.11.40 /27

Which of the following are valid host addresses on this subnet?

A - 172.18.11.42

B - 172.18.11.32

C - 172.18.11.57

D - 172.18.11.63

E - 172.18.11.0

- (1) B and D only
- (2) A and E only
- (3) A and C only
- (4) B, C and D only
- (5) A, B, C and E only

21. A student sends a message from her laptop using a web browser. The message travels through several layers before reaching the destination server. During this transmission:

- the data is divided into segments
- logical addressing is added
- the data is converted into electrical or optical signals

Which of the following sequences correctly represents the layers of the TCP/IP model, respectively, for each of the above actions?

- (1) Transport → Network → Physical
- (2) Network → Internet → Transport
- (3) Network Access → Transport → Internet
- (4) Transport → Internet → Network Access
- (5) Transport → Network Access → Physical

22. A company wants to reduce risk by implementing a new system in a limited part of the organization before deploying it throughout the entire organization. The most suitable deployment method is,

- (1) Parallel deployment
- (2) Direct deployment
- (3) Pilot deployment
- (4) Phased deployment
- (5) Agile deployment

23. Which of the following statements is correct about requirement analysis?

A - Requirement analysis helps to identify critical success factors.

B - It helps to identify conflicts between requirements.

C - Requirement analysis identifies functional and non-functional requirements.

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

24. Match the descriptions labelled D1–D4 with the appropriate information systems labelled A–E.

Description	Information System
D1 - Systems used to collect, store, analyze, and display location-based	A - Management Information Systems (MIS)
D2 - Systems that integrate and manage an organization's business processes through a centralized system.	B - Geographical Information Systems (GIS)
D3 - Systems that provide summarized information from organizational data to support managerial decision-making	C - Enterprise Resource Planning Systems (ERP)
D4 - Systems that use a knowledge base and inference rules to provide solutions or recommendations similar to a human expert.	D - Expert Systems (ES)

Choose the correct answer:

- (1) D1–B, D2–A, D3–D, D4–C
 (2) D1–B, D2–C, D3–A, D4–D
 (3) D1–C, D2–B, D3–D, D4–A
 (4) D1–A, D2–D, D3–C, D4–B
 (5) D1–A, D2–C, D3–B, D4–D

25. Four different system development situations are given below.

- A - A project needs to be developed quickly with frequent user feedback.
 B - A software company develops a high-risk medical system and continuously evaluates risks at each stage before proceeding.
 C - A government project requires strict documentation, clear stages, and no changes once a phase is completed.
 D - A project with frequent changes, high user involvement, and delivery of small working increments until the final product meets all user requirements.

Select the correct combination of development models suitable for each of the above situations.

- (1) A–Spiral B–Agile C–Waterfall D–RAD
 (2) A–RAD B–Spiral C–Waterfall D–Agile
 (3) A–Agile B–Waterfall C–RAD D–Spiral
 (4) A–RAD B–Spiral C–Agile D–Waterfall
 (5) A–Waterfall B–RAD C–Spiral D–Agile

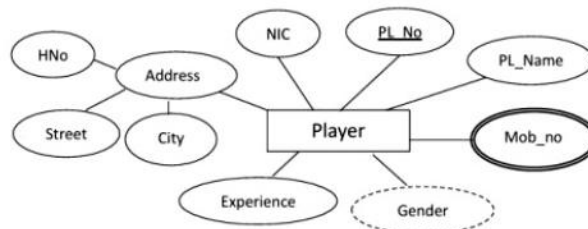
26. A software company develops an online banking system. The testing process includes the following stages.

Testing Types	Activities
A - Integration Testing	P - Modules are combined and tested
B - Unit Testing	Q - The whole system is tested as one
C - Acceptance Testing	R - Selected users test the system and give feedback before release
D - System Testing	S - Individual modules are tested separately

Which of the following shows the correct match between two columns and arrange in testing types in the order they carry out?

- (1) B–S → A–P → D–Q → C–R
 (2) A–P → B–S → D–Q → C–R
 (3) B–P → A–S → D–Q → C–R
 (4) B–S → D–Q → A–P → C–R
 (5) A–S → B–P → D–Q → C–R

- Below is a diagram showing the attributes of a player. Use this diagram for questions 27 and 28.



27. The attribute not represented in this diagram is

- (1) Derived Attribute.
- (2) Multi-valued Attribute.
- (3) Composite Attribute.
- (4) Descriptive Attribute.
- (5) Primary Key Attribute.

28. The correct relational schema for Player Entity is,

- (1) Player (PL_No, PL_Name, Address, HNo, Street, City, NIC, Experience, Mob_no)
- (2) Player (NIC, PL_No, PL_Name, HNo, Street, City, Experience, Gender)
- (3) Player (PL_No, PL_Name, HNo, Street, City, NIC, Experience)
- (4) Player (NIC, PL_No, PL_Name, HNo, Street, City, , Experience, Mob_no, Gender)
- (5) Player (PL_No, PL_Name, Address, HNo, Street, City, NIC, Experience, Mob_no, Gender)

- The following is a part of two database tables relating to employees and sections of a certain organization. Use the tables to answer questions 29 and 30.

Employee

Empno	Empname	Gender	Address	Join_Date	Sectcode
E01	Samantha	F	Kalutara	22.03.17	H1
E02	Kamala	M	Wadduwa	23.06.01	P1
E03	Gamini	M	Dehiwala	23.09.13	M1
E04	Jayamini	F	Panadura	24.01.01	P1
E05	Wijesinghe	M	Colombo	24.08.28	H1

Section

Sectcode	SectName
H1	HR
P1	Production
M1	Marketing

29. Which of the following statements about the above tables are true?

- A - The relationship between Employee and Section is 1:1.
 B - Both tables are in third normal form.
 C - Referential integrity is maintained between the Employee and Section tables through Sectcode.

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

30. The correct SQL statement to output the Employee number, name, and Join_Date of male employees working in the HR department is,

- (1) SELECT Empno, Empname, Join_Date FROM Employee, Section WHERE SectName= HR AND Gender= M;
- (2) SELECT Empno AND Empname AND Join_Date FROM Employee, Section WHERE SectName= 'HR' AND Gender= 'M';
- (3) SELECT Empno, Empname, Join_Date FROM Employee WHERE Sectcode = 'H1' AND Gender= 'M';
- (4) SELECT Empno, Empname, Join_Date FROM Employee WHERE SectName= 'HR' Gender= 'M' Section.Sectcode = Employee. Sectcode;
- (5) SELECT Empno, Empname, Join_Date FROM Employee, Section WHERE SectName= 'HR' AND Gender= 'M' AND Section.Sectcode = Employee. Sectcode;

31. Which of the following correctly describes the generalization of the EER diagram?

- (1) Dividing a superclass into specific subclasses.
- (2) Merging several lower-level entities into a higher-level entity.
- (3) Removing or modifying redundant attributes.
- (4) Combining several data values to produce a single result.
- (5) Assigning primary keys and foreign keys.

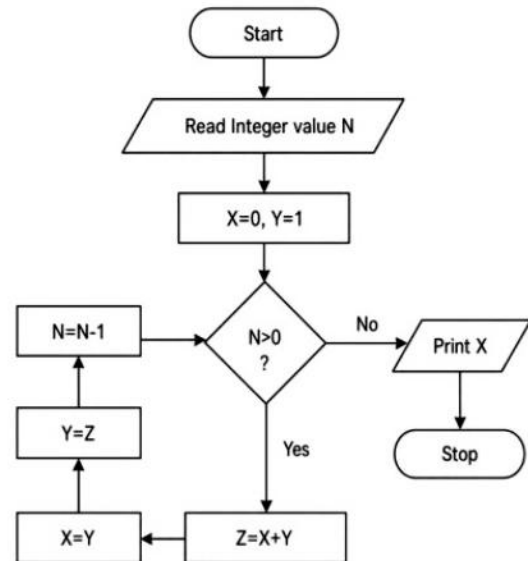
• Consider below flowchart to answer the questions 32 and 33

32. If the user inputs 4 for N at the start, what will be the final printed output of X?

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

33. What happens to the program if the user inputs -2 for N?

- (1) The program never initiates
- (2) The program enters an infinite loop.
- (3) The program outputs -2.
- (4) The program bypasses the loop entirely and outputs 0.
- (5) The program crashes due to a negative number error.



34. Which of the following expressions are valid?

- A. 5 + "5"
- B. "5" + "5"
- C. 5 * "5"
- D. "5" - "2"
- E. 10 / 2

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

35. Evaluate the expression below. What is the printed value?

result = 2 + 3 * 4 ** 2 - 1
print(result)

- (1) 25
- (2) 49
- (3) 53
- (4) 97
- (5) 100

36. Which code segment will print a square pattern as given below?

```

**
**
  
```

- | | | |
|--|---|---|
| A. for i in range(2):
for j in range(2):
print(" ", end="")
print() | B. for i in range(2):
print(" " * 2) | C. for i in range(2):
for j in range(3):
print(" ") |
| D. for i in range(2):
for j in range(i):
print(" ") | E. print(" " * 2) | |

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

37. Which scenario best represents the use of the imperative programming paradigm?

- (1) A program uses reusable functions without modifying data.
- (2) A program defines a sequence of steps to calculate the total of student marks.
- (3) A program reacts to user clicks in a graphical interface.
- (4) A program models real-world entities as interacting objects.
- (5) A program describes the desired output without specifying steps.

38. What is a key characteristic of a compiler?

- (1) Slower execution speed than the interpreter.
- (2) Requires full translation before any execution can begin.
- (3) Cannot detect errors of the source code.
- (4) Executes the source code line by line.
- (5) No output file generated from the source code.

39. Select the correct HTML code segment to insert the audio file "song" to a web page

- (1) `<audio src="song.mp3"></audio>`
- (2) `<a href="song">song.mp3</a>`
- (3) `<Source src="song.mp3"></source>`
- (4) `<audio><source src="song.mp3"></audio>`
- (5) `<audio source src="song.mp3"></audio>`

40. Consider below statements regarding HTML,CSS and PHP .

A - PHP is a server-side scripting language.

B - CSS is used to make a HTML document more visually appealing.

C - The output of an HTML document can be formatted using spaces, tabs, and blank lines.

Select correct statement/statements from the above.

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

41. What is the output of the below PHP program?

```
<?php
$f = 'ICT';
$b = $f;
$b = "I Like $b";
echo $b;
echo $f;
?>
```

- (1) Error
- (2) I Like ICT ICT
- (3) I Like ICT I Like ICT
- (4) I Like ICTICT
- (5) No output

42. Select the correct HTML code segment to render the below output.

Day	Subjects	
	Morning	Evening
Monday	HTML	Python
Tuesday	CSS	Database
Wednesday	Project Practice	

(1)	<pre><table border="1"> <tr><td rowspan="2">Day</td><td colspan="2">Subjects</td></tr> <tr><th>Morning</th><th>Evening</th></tr> <tr><td>Monday</td><td>HTML</td><td>Python</td></tr> <tr><td>Tuesday</td><td>CSS</td><td>Database</td></tr> <tr><td>Wednesday</td><td colspan="2">Project Practice</td></tr> </table></pre>
(2)	<pre><table border="1"> <tr><th colspan="2">Day</th><th rowspan="2">Subjects</th></tr> <tr><th>Morning</th><th>Evening</th></tr> <tr><td>Monday</td><td>HTML</td><td>Python</td></tr> <tr><td>Tuesday</td><td>CSS</td><td>Database</td></tr> <tr><td>Wednesday</td><td colspan="2">Project Practice</td></tr> </table></pre>
(3)	<pre><table border="1"> <tr><th rowspan="2">Day</th><th colspan="2">Subjects</th></tr> <tr><th>Morning</th><th>Evening</th></tr> <tr><td>Monday</td><td>HTML</td><td>Python</td></tr> <tr><td>Tuesday</td><td>CSS</td><td>Database</td></tr> <tr><td>Wednesday</td><td colspan="2">Project Practice</td></tr> </table></pre>
(4)	<pre><table border="1"> <tr><th rowspan="2">Day</th><th colspan="2">Subjects</th></tr> <tr><th>Morning</th><th>Evening</th></tr> <tr><th>Monday</th><td>HTML</td><td>Python</td></tr> <tr><th>Tuesday</th><td>CSS</td><td>Database</td></tr> <tr><th>Wednesday</th><td colspan="2">Project Practice</td></tr> </table></pre>
(5)	<pre><table border="1"> <tr><th rowspan="2">Day</th><th colspan="2">Subjects</th></tr> <tr><th>Morning</th><th>Evening</th></tr> <tr><td>Monday</td><td>HTML</td><td>Python</td></tr> <tr><td>Tuesday</td><td>CSS</td><td>Database</td></tr> <tr><td>Wednesday</td><td rowspan="2">Project Practice</td></tr> </table></pre>

- Consider the below HTML code segment to answer questions 43 to 44

```
<head><style>
.highlight { background-color: red; }
#special{ text-decoration: underline; }
</style></head><body>
<p class="highlight">Paragraph One</p>
<p>Paragraph Two</p>
<p class="highlight" id="special">Paragraph Three</p>
<h2 class="highlight" id="special">Heading One</h2></body>
```

43. Which element contents will have a red background?
- (1) Paragraph One, Paragraph Three, Heading One
 - (2) Paragraph Two, Paragraph Three, Heading One
 - (3) Paragraph One, Paragraph Two, Heading One
 - (4) Paragraph One, Heading One
 - (5) Paragraph One, Paragraph Three
44. Which element contents will have an underline?
- (1) Paragraph One, Heading One
 - (2) Paragraph Three
 - (3) Heading One
 - (4) Paragraph Three, Heading One
 - (5) Paragraph One, Paragraph Three
45. In an IoT-based smart agriculture system, soil moisture sensors send data to a central system that automatically turns on irrigation when needed.
- What is the main advantage of this system?
- (1) It reduces human intervention.
 - (2) It eliminates the need for internet connectivity
 - (3) It prevents all hardware failures
 - (4) It increases water usage unnecessarily
 - (5) It stores data without using it
46. A student connects an LED to a microcontroller GND (ground) pin through a 220Ω resistor. When the program sets the pin to HIGH, the LED turns on. What is the PRIMARY purpose of the 220Ω resistor?
- (1) To increase the brightness of the LED
 - (2) To limit the current flowing through the LED
 - (3) To act as a switch for the LED
 - (4) To store energy for the LED
 - (5) To filter noise from the power supply
47. Which of the following best describes the term group purchasing?
- (1) A single buyer purchasing large quantities from multiple sellers.
 - (2) A seller offering discounts to individual buyers.
 - (3) An e-marketplace where sellers and buyers negotiate online.
 - (4) Multiple sellers offer prices to a buyer.
 - (5) Multiple buyers combining orders to secure discounts from sellers.

48. Which of the following is **not** an advantage of e-transactions?

- (1) They allow businesses to reach a global market quickly.
- (2) They reduce transaction costs compared to traditional methods.
- (3) They provide convenience and 24/7 accessibility for consumers.
- (4) They eliminate all risks of fraud and security breaches.
- (5) They enable faster communication between buyers and sellers.

49. Which of the following are examples of man-machine coexistence?

- A. A human surgeon performing an operation assisted by a robotic arm.
- B. Two robots assembling a car together without human involvement.
- C. A factory worker using an exoskeleton suit to lift heavy objects safely.

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

50. Consider the following Artificial Intelligence concepts and descriptions:

- A. Emotional / affective computing : A system that detects user emotions from text and adapts its responses accordingly.
- B. Quantum computing : A computer program that learns from data to make predictions without explicit programming.
- C. Bio-inspired computing : A type of computing inspired by the structure and function of the human brain.

Which of the above are correct?

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

සියලුම හිමිකම් ඇවිරිණි./All Rights Reserved.

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 மேல் மாகாண கல்வித் திணைக்களம்
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අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2026

கல்விப் பொதுத் தராதரப் பத்திர (உயர் தரப் பரீட்சை, 2026

General Certificate of Education (Atv. 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 16 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 2-10)

- * 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 11-16)

- * This part consists 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 Examiner's 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 :	

Part A – Structured Essay
Answer **all four** questions on this **paper itself**

Do not
write in
this
column

1. (a). Draw the expected output of the following HTML code segment when rendered by a web browser.

```
<u>Available Courses</u>
<ol>
<li>Information Technology</li>
<li>Engineering</li>
<li>Business Management
<ul><li>Accounting</li>
<li>Marketing</li></ul></li>
<li>Law</li>
</ol>
```

Note: Consider the following dotted line box as the display area of the browser.

- (b) Write the correct external CSS code to apply the following formatting to the above HTML list.

- (i). Display all list items in Times New Roman font.
- (ii). Change the ordered list text color to dark green.
- (iii). Set the unordered sub-list items to italic style.
- (iv). Add a 1-pixel solid black border around the entire list section.
- (v). Set the background color of the page to light gray.

- (i).....
- (ii).....
- (iii).....
- (iv).....
- (v).....

(c). Consider the HTML form given in Figure 1 rendered by a web browser.

Library Membership Form

Member Name :

Enter Membership Type :

1. Student
2. Teacher

Preferred Notification Method :
☐ Email ☐ SMS

Select Library Branch :

Figure 1

The relevant HTML code (incomplete) is given below. Fill in the blanks to obtain the output shown in Figure 1.

```

<html>
<head>
<title>Library Membership Form</title>
</head>
<body>
<h3>Library Membership Form</h3>
<form _____="register.php" _____="post">
<div>Member Name :<input type = _____="mname"></div>
<p><div>Enter Membership Type :
<input type= _____="mentype" _____="10">
<ol><li>Student</li><li>Teacher</li></ol>
</div>
<br>
<div>
Preferred Notification Method :
<input type = _____="notify" _____="Email">Email
<input type = _____="notify" _____="SMS">SMS
</div>
<br><div>
Select Library Branch :
<_____ name="branch">
<option _____="Colombo">Colombo</option>
<option _____="Kalutara">Kalutara</option>
<option _____="Gampaha">Gampaha</option>
</_____></div><br>
<input type=_____ value=_____>
</form>
</body>
</html>

```

(d). The details entered through the HTML form are to be stored in a database table named `member`.

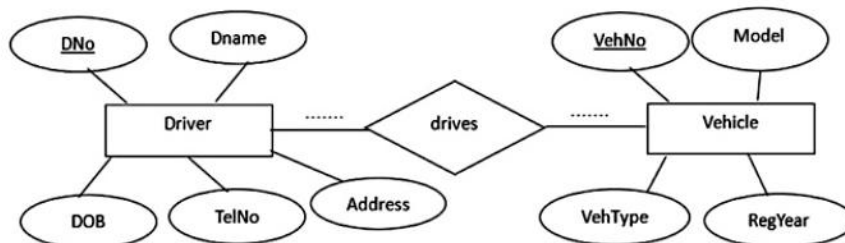
The following PHP code segment is incomplete. Fill in the blanks to insert the submitted form data into the `member` table.

```
<?php
$connection = new mysqli("localhost","root","","libraryDB");
if ($connection -> connect_errno) {
    echo "Failed to connect to MySQL: " . $connection -> connect_error;
    exit();
}

$mname = $_POST [_____];
$memtype = $_POST [_____];
$notify=$_POST [_____];
$branch = $_POST [_____];
$sql = "INSERT INTO member
      (memberName, membershipType, notificationMethod, branch)
      VALUES
      (_____, _____, _____, _____) ";
if ($connection->query($sql) === TRUE) {
    echo "New record created successfully";
}
else {
    echo "Error: " . $sql . "<br>" . $connection->error;
}
$connection -> close();
?>
```

2. (a). Consider the following ER diagram designed for a company that provides car rental services.

- Drivers register with the organization along with their vehicle, where they are assigned a unique number. The driver is not allowed to drive any other vehicle except their own.



- (i). Indicate the cardinality between the driver and the vehicle entities in the blanks provided in the above ER diagram.
- (ii). The number of years a vehicle has been driven by a driver should be recorded. Draw the attribute NoOfYears in the relevant position of the ER diagram above.
- (iii). Only drivers registered with the company are entitled to a special interest-free insurance policy (InsurancePolicy). They are entitled to the insurance only during the period of their service to the company. Drivers can obtain several insurance policies according to their needs, and the relevant insurance policy is unique to that driver only. Each insurance policy has the attributes InsName, TimePeriod, Benefits. Show this case in the ER diagram above.

(b). Below are some tables related to the database created for a School Library System

Book

<u>BookId</u>	BookName	NoOfCopies
A001	Madolduwa	5
A002	Pin Lamaya	2
A003	Gamperaliya	3
B002	Famous Five	3

Student

<u>StuId</u>	StuName	Class
S001	Smanthi	10A
S002	Kamal	10A
S003	Sanjeewa	10A
S018	Sanduni	11B
S020	Nehan	11B

BorrowBook

<u>BookId</u>	<u>StuId</u>	BorrowDate	ReturnDate
A001	S001	2025-03-01	2025-03-08
A001	S002	2025-03-10	2025-03-17
A002	S001	2025-03-01	2025-03-08
A003	S018	2025-05-13	2025-05-21
B002	S018	2025-05-21	2025-05-28
B002	S002	2025-05-21	2025-05-28

- (i). State the correct SQL query to create the Book table. No field should allow NULL values, and the primary key must be specified.

.....

.....

.....

.....

.....

.....

.....

- (ii). The number of copies of the book *Gamperaliya* has been increased to 5. State the correct SQL query for this.

.....

.....

.....

- (iii). Write the output of the following SQL query based on the above tables.

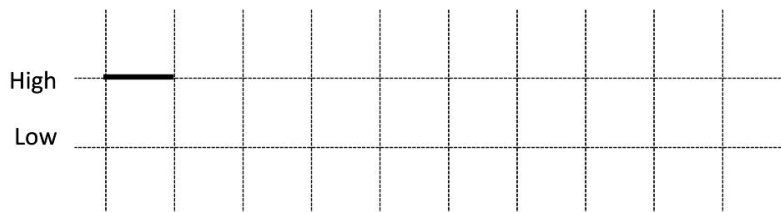
```
SELECT StuName, Class
FROM Student, BorrowBook
WHERE BorrowDate='2025-05-21' AND
Student.StuId=BorrowBook.StuId;
```

.....

- (c) The following bit stream is transmitted over a digital channel.

0110111001

The left-most bit is sent first and it has already been plotted for you. Plot the remaining bits using NRZ-I (Non-Return to Zero Inverted) encoding method.



- (d). Draw a schematic diagram to show the connection between two computers via a PSTN.

.....

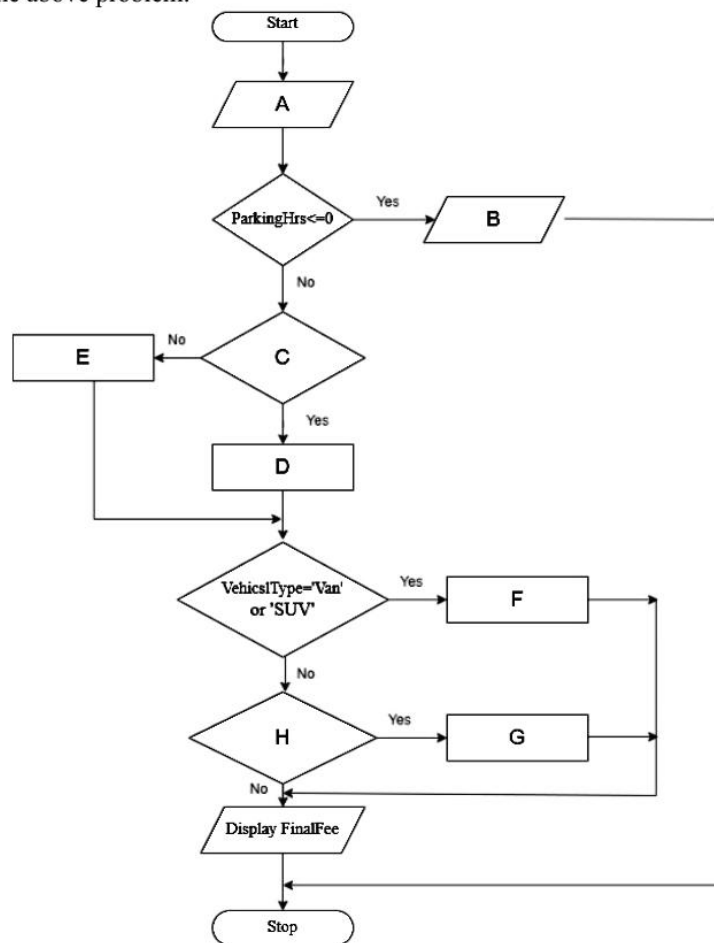
3. (a) A flowchart is to be drawn for an algorithm used in a smart parking system to calculate and display the parking fee of a vehicle.

The number of parking hours and the vehicle type are given as inputs.

Note:

- The first 2 hours are charged at Rs. 100 per hour.
- Additional hours are charged at Rs. 150 per hour.
- If the vehicle type is “Van” or “SUV(Sport Utility Vehicle)”, an additional fixed charge of Rs. 500 should be added.
- If the number of parking hours is less than or equal to 0, the algorithm should display “**Invalid Parking Duration**” and should not calculate the fee.
- If the total parking fee exceeds Rs. 5000, a discount of 5% should be deducted from the final amount.

Write down the most suitable replacements for labels A to H in the following flowchart which is drawn for the above problem.



A -
 B -
 C -
 D -

E -
 F -
 G -
 H -

(b) The Python code given below is written to display all odd numbers from a first given number to a second given number.

The program always checks whether the first number is less than the second number. If the first number is greater than or equal to the second number, the user is requested to re-enter both numbers.

Complete the program by filling the blanks.

```
while True:
    fnum= int(input("Enter the first number: "))
    snum= int(input("Enter the second number: "))
    if _____:
        _____
    else:
        print("Invalid input. Please re-enter the numbers.")
while _____:
    if _____:
        print( _____)
    _____
```

(c). Write down the replacements for the labels in the following Python program which has been coded to write student names and marks stored in two lists named student_names and student_marks to a new file named 'students.txt'.

```
def write_student_data(names, marks):
    file = open("students.txt", _____ A _____)
    for i in range( _____ B _____(names)):
        file.write(names[i] + " " + _____ C _____(marks[i]) + "\n")
    file. _____ D _____
student_names = ["Kamal", "Nimal", "Sunil"]
student_marks = [75, 82, 90]
write_student_data(student_names, student_marks)
```

A-

B-

C-

D-

4. (a) The CPU of a computer is currently executing process P1. A high-priority process, P3, arrives, and the scheduler immediately selects P3 for execution. To make room for P3 in main memory, process P2, which was waiting to write data to the disk, was moved from main memory to secondary storage.

(i). Write the state transitions of processes P1 and P2.

.....

(ii). Write two tasks carried out by the operating system for each of the processes P1 and P3 during their context switch.

.....

(b). For each allocation method below, write the data items kept in the directory by the operating system to locate files.

(i). Contiguous allocation

(ii). Linked allocation

(iii). Indexed allocation

(c). Consider a disk that uses the File Allocation Table (FAT) file system for managing its storage. The cluster size is 4 KB. A file named DataFile.txt of size 125 KB needs to be stored on this disk. Calculate the amount of internal fragmentation. Show your workings clearly.

.....

(d). A system with byte addressable memory uses 1 GB of physical memory and the virtual memory of 4 GB. The size of a page is 4 KB.

A few selected fields of the page table used by a process at a particular time are given below.

	Frame number	Absent/ Present
0	0	0
1	2	1
2	0	0
3	12	1
:	:	:
8	9	1
9	0	0
:	:	:

Notes:

- The page number is used as the index to the page table.
- The frame numbers are in decimal.

(i). Calculate the number of pages of the above system.

.....
.....

(ii). Each entry of the page table consists of frame number bits(18 bits), an absent/present bit and 8 more bits. The maximum size of the page table is $m \times 2^n$ bits. What are the values of m and n?

.....
.....

(iii). What is the function of the modified (dirty) bit in a page table entry?

.....
.....
.....
.....

(iv). Assume that a virtual address in page number 2 is requested by the CPU. List the main tasks performed by the operating system in order to fulfill the request.

.....
.....
.....
.....

බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව மேல் மாகாணக் கல்வித் திணைக்களம் Department of Education - Western Province			
තෙවන වාර පරීක්ෂණය மூன்றாம் தவணைப் பரீட்சை - 2026 Third Term Test			
ශ්‍රේණිය தரம் } 13 Grade	විෂයය பாடம் } Information & Communication Technology Subject	පත්‍රය வினாத்தாள் } II Paper	පැය மணித்தியாலம் } 3 Hours

* Answer any **four** questions only.

5.(a). Simplify the following Boolean expression using Boolean algebra and prove that

$$\bar{A} \cdot B + (B \oplus C) + (\bar{B} + \bar{C}) \cdot \bar{A}B = \bar{A}BC$$

(b). Consider the following three cases of a digital system with three inputs X,Y,Z.

$$P = \bar{X}$$

$$Q = \bar{Y} + Z$$

$$R = \overline{(X + Y)}$$

Three intermediate conditions P, Q, and R are generated from the inputs X, Y, and Z. The output F becomes TRUE (1) only when both P and Q are TRUE simultaneously, or when R is TRUE. For all other combinations, the output becomes FALSE (0).

A student intends to implement this logic circuit using minimum number of gates.

For this purpose, he derives both the Standard Sum of Products (SOP) expression and the Standard Product of Sums (POS) expression for the output F.

Answer the following questions.

- Draw the truth table representing the above logic condition. Clearly indicate the values of X, Y,Z, and P, Q, R, and F.
- Write the Standard SOP expression, and the Standard POS expression for the output F.
- Using Karnaugh maps (K-Maps), simplify the POS expression obtained in part (ii).
- Draw the circuit for the simplified expression using minimum number of gates.

6. (a) Gayan and Hiran communicate over the internet using public key encryption. Gayan wants to send a confidential and trustworthy message to Hiran. He considers the following two methods:

Method A : Gayan encrypts the message using Hiran's public key, and Hiran decrypts it using his private key.

Method B : Gayan encrypts the message using his own private key, and Hiran decrypts it using Gayan's public key.

- State the main purpose of each method (A and B) in the communication process.
- Gayan decides to use both Method A and Method B together when sending a message. Explain how this combination improves overall security.

- (b) A university has three faculties and all three faculties are in the same premises. The following table shows the devices available in each faculty.

Faculty	Devices
Engineering	58 Computers, 2 Network Printers
Science	28 Computers, 1 Printer
Arts	18 Computers, 1 Network Printer

The network administrator of the university has received the IP address block 172.30.54.0 /25 to be used for the university network. The network administrator has to design a subnetwork for each faculty considering the following requirements.

- It is necessary to interconnect all the LANs together to make the communication easy and to connect all the subnets to the Internet through a Proxy server.
 - Computers of engineering faculty are provided IP addresses dynamically.
 - The entire network is to be protected through a firewall.
- (i). Write down the network address, broadcast address, subnet mask and usable IP address range of each subnet. Use the following table to present your answer.

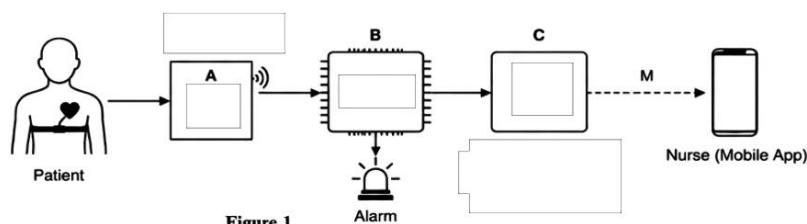
Faculty	Network Address	Broadcast Address	Subnet Mask	Usable IP Address Range
Engineering				
Science				
Arts				

- (ii). Draw a network diagram to show the logical arrangement of the university's computer network identifying all required devices.
- (iii). The university is organizing an online academic event where multiple services are running simultaneously.
- A - A live video streaming session for lectures
 - B - A file download portal for course materials
 - C - A real-time online quiz system for assessments

Identify the most suitable protocol (TCP or UDP) for each of the above services and justify your answer.

- 7.(a). An IoT-based patient monitoring system is used in a smart hospital ward. Nurses can monitor patients using a mobile application. The setup includes a controller, a microcontroller board with a communication module and a heart-rate sensor.

The system diagram contains components labeled **A**, **B**, and **C** and an arrow **M** connecting the mobile device to the system, as shown in figure 1.



(i). Match the IoT components labeled **A, B, and C** with the following:

- Controller
- Heart-rate Sensor
- Arduino Board with Communication Module

(ii). Explain why the arrow **M** is shown in a single direction .

(b). The above setup is connected to an emergency alarm system. The following is the algorithm used to automate the emergency alarm system.

The heart-rate sensor provides readings from 1 to 10, where:

```
While (true) {
    Read Heart Rate as H_R
    If [X]
        If Alarm Off
            Then [Y]
        End if
    Else
        If Not Alarm Off
            Then [Z]
        End if
    End if
}
```

- 1 = Very low heart rate
- 10 = Very high heart rate

The normal level to maintain is between 4 and 6 inclusive.

Write the most suitable entries for **X, Y, and Z**.

(c). What could be monitored in the hospital ward using a temperature sensor?

(d). A multi-agent system is introduced for the hospital. A Simplified diagram of this system is given in figure 2.

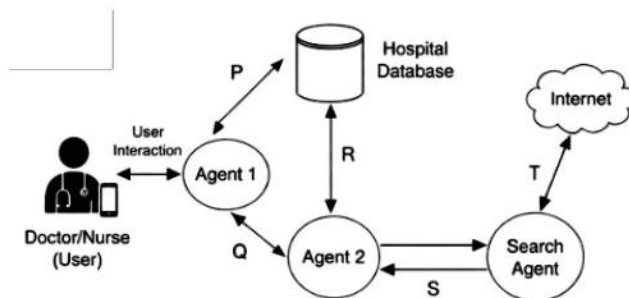


Figure 2

- Patient reports and scan images are stored in the hospital database.
- **Agent 1** handles communication with doctors and nurses and triggers Agent 2.
- **Agent 2** analyzes patient reports, detects possible medical issues, and triggers Search Agent if needed.
- **Search Agent** searches the Internet for treatment guidelines and sends the information to Agent 2.
- **Agent 2** updates the database and notifies **Agent 1** if urgent attention is required.

(i). In this scenario, identify the self-autonomous agents.

(ii). The interaction **P** involves storing and retrieving patient records for Agent 1. Interaction **R** involves updating treatment information in the database. Explain the interactions **Q** and **S**.

(iii). After long-term use, it is decided to remove the Search Agent because the database already contains many treatment records. State one major disadvantage of removing the Search Agent

- (e). The hospital has introduced a mobile application that allows patients nearby to book appointments and receive medical consultation services online.
- (i). State one advantage of limiting appointment services to patients within the nearby area.
 - (ii). State an alternative method that can be used to confirm appointments until an online payment system is introduced.

8. A smart restaurant uses a digital ordering system to manage customer orders.

Each table in the restaurant has a tablet device where customers can place orders. The system stores the ordered item names and their prices.

- (a). The following Python code inputs four prices of food items and calculates the total bill.

```
prices = []
total = 0.0
for i in range(4):
    p = float(input("Enter item price: "))
    prices.append(p)
    total = total + p
print(prices)
print(total)
```

What is the output of the above code if the following prices are entered?

- 1200
 - 850
 - 650
 - 1300
- (b). The restaurant manager now wants the system to identify the most expensive food item and its price using the food prices entered in part (a).

Write a Python function called `ExpensiveItem()` that:

- Takes two separate lists for names of food items and their prices as parameters.
- returns the name of the food item with the highest price.

State your assumptions, if any.

- (c). The restaurant later introduces a smart kitchen monitoring system. The kitchen has 3 cooking sections:

- Baking Section
- Frying Section
- Grilling Section

Temperature sensors are installed in each section to record temperatures during 3 different time periods of the day:

- Morning
- Afternoon
- Evening

The recorded temperatures are stored in a two-dimensional array as follows:

```
Temp = [ [180, 200, 190], [210, 205, 195], [175, 185, 220]]
```

Write a Python program to:

- Find the highest temperature in the array.
- Display whether the kitchen temperature is Safe or Danger.
 - "Safe" if the highest temperature is less than or equal to 220.
 - "Danger" if the highest temperature is above 220.

9.(a). The following are the details required to create a database system for a private bank.

- The bank [Bank] consists of a unique registration number and bank name.[RegCode, BankName]
- The bank has several branches [Branch]. Each branch has a unique branch number, branch name, and address.[BrNo, BrName, Address]
- Each branch maintains different customer accounts [Account]. An account contains a unique account number, account type, deposited amount, time period, interest, deposit date, and maturity date. [AccNo, AccType, DepPrice, TimePeriod, Interest, DepDate, MatureDate]
- Customers [Customer] can open one or more accounts through a bank branch. The customer should provide personal information including NIC number, customer name, date of birth, address, and email address. A customer may also have multiple mobile phone numbers. [NIC, CusName, DOB, Address, Email, MobileNo]
- An account can be maintained individually or jointly by customers. When a customer opens an account, the system should record the account opening date and account status. [OpenDate, AccountStatus]

(i). Study the above scenario carefully and draw an ER diagram.

Note : use only the terms given within square brackets in the above description for the entities and attributes.

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

(b). Consider the following table which shows software projects of a private company.

Project

PCode	PTitle	MID	MName	EmpNo	EmpName	MobileNo	DepNo	DepName	Budget
LK120	OOS	E002	Yasantha	P_623	Prasad	0712212303	01	Personal	US\$2000
UK50	DAS	E005	Sunil	S_443	Dulitha	0773694455	02	Sales	US\$1500
LK170	LMS	E002	Yasantha	P_623	Prasad	0712212303	01	Personal	US\$500
NZ78	GPS	E006	Kumara	P_928	Sadamali	0705846111	01	Personal	US\$4500
UK57	ODS	E002	Yasantha	S_443	Dulitha	0773694455	02	Sales	US\$200

(i). State three data anomalies and explain one of the anomalies using the above table.

(ii). In which normal form does the above table exist? Justify your answer.

(iii). Convert the table into next normal form and write relational schema.

10. (a). The following activities take place in a fully computerized Workshop Management System of an educational institute.

• Handling Online Registration

Students access the online workshop management system through the institute website to view available workshops. The system checks the workshop database and displays available workshops, schedules, and seat availability.

If the student decides to register, the student enters personal details through an online registration form. The system stores the entered details in the student database and automatically generates a unique student number.

- **Handling Online Payments**

The student uses the generated student number to make an online payment through the payment gateway. The system verifies the payment with the bank system, updates the payment database, and generates an electronic receipt & login detail. A copy of the receipt and the generated login details are saved in the student database.

- **Handling Workshop Materials & Reporting**

After the successful payment, student logs into the system using by entering login details and downloads workshop materials such as note sets and additional resources.

At the end of each month, the system automatically generates workshop reports using data from the student database, workshop database, and payment database, and sends the reports to the Academic Manager.

Using standard symbols,

(i). Draw the Context Diagram for the above system.

(ii). Using standard symbols, draw the Level-1 Data Flow Diagram (DFD).

(b). During the system development process, the institute evaluates different types of feasibility to determine whether the system should be implemented successfully.

Identify the most suitable feasibility type for each situation.

- (i). The management evaluates whether the new workshop management system supports the institute's future educational goals and policies.
- (ii). Before introducing the computerized workshop management system, the institute checks whether enough computers, servers, and internet facilities are available.
- (iii). Some registration officers are not willing to use the new computerized workshop management system and prefer the old manual method.
- (iv). The institute compares the cost of developing the workshop management system with the expected benefits such as faster registration and reduced paperwork.

බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department	බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව මෙම මාකානෙක් කල්විත් තිணைக்களාම Department of Education - Western Province	බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department බණ්ඩාරි: හුද් සයාස පොත්සාහිදි බෙං පාසාසෙ හබ්දි තිසාසෙහි Western Province Education Department
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Paper I

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	(3)	11	(4)	21	(5)	31	(2)	41	(4)
2	(5)	12	(1)	22	(3)	32	(2)	42	(3)
3	(5)	13	(5)	23	(5)	33	(4)	43	(1)
4	(1)	14	(2)	24	(2)	34	(3)	44	(4)
5	(3)	15	(4)	25	(2)	35	(2)	45	(1)
6	(1)	16	(2)	26	(1)	36	(1)	46	(2)
7	(3)	17	(5)	27	(4)	37	(2)	47	(5)
8	(5)	18	(3)	28	(3)	38	(2)	48	(4)
9	(2)	19	(2)	29	(4)	39	(4)	49	(4)
10	(2)	20	(3)	30	(5)	40	(3)	50	(1)

$$2 \times 50 = 100$$

Paper II		
Q no	Answer	Marks
1. a)	<u>Available Courses</u> - Information Technology - Engineering - Business Management - Accounting - Marketing - Law Output of <u> tag -> ½ tag -> ½ tag -> ½	½ x 3 = 1 ½ marks
(b) (i)	li { font-family: 'Times New Roman'; }½	½ x 5 = 2 ½ marks
(ii)	ol { color: darkgreen; }½	
(iii)	ul { font-style: italic; }½	
(iv)	ol { border: 1px solid black; }½	
(v)	body { background-color: lightgray; }½	

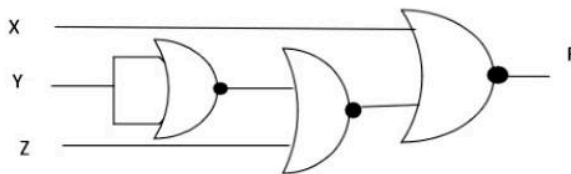
(c)	action ½ method ½ "text" name ½ "text" name size ½ "radio" name value ½ "radio" name value ½ <select> value </select> ½ "submit" ½ "Register" ½	½ x 8 = 4 marks
(d)	'mname' 'memtype' 'notify' 'branch' 1 '\$mname', '\$memtype', '\$notify', '\$branch' 1	1 x 2 = 2 marks
2.(a).(i).	1:1	1mark
(a).(ii). (a).(iii).	<pre> erDiagram Driver --o{ Vehicle : drives Driver --o{ InsurancePolicy : obtain Driver { string DNo PK string Dname string DOB string TelNo string Address } Vehicle { string VehNo PK string Model string VehType string RegYear } InsurancePolicy { string InsName PK string TimePeriod string Benefits } Driver } --} InsurancePolicy : obtain Driver } --} Vehicle : drives </pre> *Correct derived attribute 1 mark *Correct weak entity with 3 attributes and cardinality 2 marks A 1 mark- weak entity with 3 attributes B 1 mark- Correct cardinality	1 mark 2marks

(b).(i).	<pre>CREATE TABLE Book (BookId varchar (10) NOTNULL, BookName varchar (15) NOTNULL, NoOfCopies int NOTNULL PRIMARY KEY (BookId));</pre> A 1 mark- Complete CREATE statement with fields and datatypes B 1 mark- Correct syntax and NOT NULL or PRIMARY KEY (---A)	2 marks						
(ii).	<pre>UPDATE TABLE Book SET NoOfCopies = 5 WHERE BookId = 'A003 ';</pre>	1 mark						
(iii).	<table><tr><td>StuName</td><td>Grade</td></tr><tr><td>Sanduni</td><td>11B</td></tr><tr><td>Kamal</td><td>10A</td></tr></table>	StuName	Grade	Sanduni	11B	Kamal	10A	1mark
StuName	Grade							
Sanduni	11B							
Kamal	10A							
(c).	0110111001 High Low	1 mark						
(d).		1mark						

3. (a)	A - Input ParkingHrs, VehicleType ½ B - Display "Invalid Parking Duration" ½ C - ParkingHrs > 2 ½ D - Fee = (2 × 100) + ((ParkingHrs – 2) × 150) 1 E - Fee = ParkingHrs × 100 ½ F - Fee = Fee + 500 ½ G - Fee > 5000 ½ H - Fee = Fee – (Fee × 0.05) OR Fee = Fee × 0.95 1	5 marks
(b)	fnum < snum: ½ Break ½ fnum <= snum: ½ fnum % 2 != 0: ½ Fnum ½ fnum += 1 ½	3 marks
(c)	A - "w" ½ B - len ½ C - str ½ D – close() ½	2 marks
4 (a) (i)	P1 : Running → Ready P2 : Blocked → Swapped-out & Blocked / Suspended & Blocked	1 mark (0.5 X 2)
(ii)	A : 0.5 mark for any of the following • Saving the state of P1 into its PCB • Change P1's state to Ready (and place it back in the ready queue) B : 0.5 mark for any of the following • Allocate a PCB for P3 • Load the state of P3 from its PCB into the CPU registers • Change P3's state to running	1 mark

(b)	(i) Start Block Number , Length / No of Blocks / File Size (ii) Start Block Number (iii) Index Block Number	1.5 marks (0.5X3)
(c)	No of clusters needed = 125 / 4 = 31.25 = 32 Space allocated to the file = 4 KB x 32 = 128 KB Space required for the file = 125 KB Amount of internal fragmentation = 128 – 125 = 3 KB 0.5 – workings 0.5 – final answer	1 mark
(d) (i)	= 4 GB / 4 KB = 4 X 1024 X 1024 KB / 4 KB = 1024 X 1024 or = $2^{10} \times 2^{10}$ or = 2^{20}	1 mark
(ii)	$(18 + 1 + 8) \times 2^{20}$ $m \rightarrow 27$ $n \rightarrow 20$	2 marks (1 X 2)
(iii)	The modified bit indicates <u>whether the contents of a page in memory have been changed</u> since it was loaded from disk. It helps the OS to reduce unnecessary disk writes and ensures data consistency.	1 mark
(iv)	1. Load the requested page (missing page in RAM) from hard disk into a free frame in the main memory. 2. Update the Page table. 3. Restart the instruction.	1.5 marks (0.5X3)

5(a).	L.H.S. $\underline{AB} + (\underline{B} \oplus \underline{C}) + (\underline{B} + \underline{C}).(\underline{AB})$$\underline{AB} + \underline{BC} + \underline{BC} + (\underline{B.C}).(\underline{A} + \underline{B}) \quad \text{Demorgans' law}$$\underline{AB} + \underline{BC} + \underline{BC} + \underline{B.C.A} + \underline{B.B.C} \quad \text{Distributive Law}$$\underline{AB} + \underline{BC} + \underline{BC} + \underline{B.C.A} + \underline{B.C} \quad \text{Idempotent Law}$$\underline{AB} + \underline{BC} + \underline{BC} + \underline{B.C.}(\underline{A} + 1) \quad \text{Distributive Law}$$\underline{AB} + \underline{BC} + \underline{BC} + \underline{B.C.}(1) \quad \text{Identity Law}$$\underline{AB} + \underline{BC} + \underline{BC} + \underline{B.C} \quad \text{Identity Law}$$\underline{AB} + \underline{BC} + \underline{B(C + C)} \quad \text{Distributive Law}$$\underline{AB} + \underline{BC} + \underline{B(1)} \quad \text{Inverse Law}$$\underline{AB} + \underline{C} + \underline{B} \quad \text{Reduncancy Law}$$\underline{AB} + \underline{B} + \underline{C}$$\underline{A} + \underline{B}$$+ \underline{C} \quad \text{Reduncancy Law}$ R.H.S. $\underline{ABC}$$\underline{A} + \underline{B} + \underline{C} \quad \text{Demorgans' law}$$L.H.S. = R.H.S$ A 3 marks : 0.5 Mark each for each correct line in LHS with a simplification B 1 mark : For the RHS simplifications	4 marks																																																															
5(b).i.	<table><tr><th>X</th><th>Y</th><th>Z</th><th>P</th><th>Q</th><th>R</th><th>F</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>1</td></tr><tr><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td><td>0</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>0</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td></tr><tr><td>1</td><td>1</td><td>1</td><td>0</td><td>1</td><td>0</td><td>0</td></tr></table>	X	Y	Z	P	Q	R	F	0	0	0	1	1	1	1	0	0	1	1	1	1	1	0	1	0	1	0	0	0	0	1	1	1	1	0	1	1	0	0	0	1	0	0	1	0	1	0	1	0	0	1	1	0	0	0	0	0	1	1	1	0	1	0	0	3 Marks
X	Y	Z	P	Q	R	F																																																											
0	0	0	1	1	1	1																																																											
0	0	1	1	1	1	1																																																											
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1	1	0	0	0	0	0																																																											
1	1	1	0	1	0	0																																																											
ii.	$F_{SOP} = \underline{X} \underline{Y} \underline{Z} + \underline{X} \underline{Y} \underline{Z} + \underline{X} \underline{Y} \underline{Z}$$F_{POS} = (\underline{X} + \underline{Y} + \underline{Z}).(\underline{X} + \underline{Y} + \$																																																																

iii.	<table><tr><td>X \ YZ</td><td>00</td><td>01</td><td>11</td><td>10</td></tr><tr><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td></tr><tr><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> $F = \underline{X} \cdot (\underline{Y} + Z)$	X \ YZ	00	01	11	10	0	1	1	1	0	1	0	0	0	0	3 marks
X \ YZ	00	01	11	10													
0	1	1	1	0													
1	0	0	0	0													
iv.	 There can be used only 3 NOR gates for design simplified expression	3 marks															
06 (a) (i)	Method A: Confidentiality – Only Hiran can read the message since only he has the private key. Method B: Authentication (and Integrity) – Confirms that the message was sent by Gayan and has not been altered.	2 marks (1 X 2)															
(ii)	First, encrypts (or signs) the message with Gayan's private key. (1 mark) Then encrypts the result with Hiran's public key. (1 mark) This provides: Confidentiality (only Hiran can decrypt it) Authentication (proves it came from Gayan) / Integrity (message has not been changed)	2 marks															

(b) (i)

3 marks

Faculty	Network Address	Broadcast Address	Subnet Mask	Usable IP Address Range
Engineering	172.30.54.0	172.30.54.63	255.255.255.192	172.30.54.1 - 172.30.54.62
Science	172.30.54.64	172.30.54.95	255.255.255.224	172.30.54.65 - 172.30.54.94
Arts	172.30.54.96	172.30.54.127	255.255.255.224	172.30.54.97 - 172.30.54.126

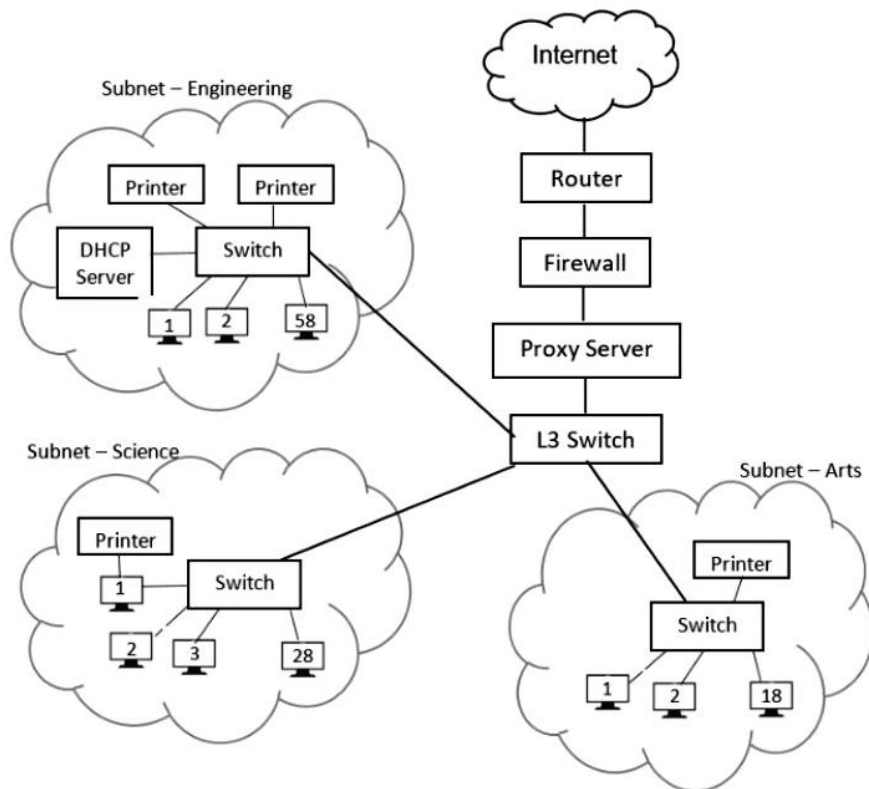
1 mark for each row
(1X 3)

Alternative:

Faculty	Network Address	Broadcast Address	Subnet Mask	Usable IP Address Range
Engineering	172.30.54.64	172.30.54.127	255.255.255.192	172.30.54.65 - 172.30.54.126
Science	172.30.54.0	172.30.54.31	255.255.255.224	172.30.54.1 - 172.30.54.30
Arts	172.30.54.32	172.30.54.63	255.255.255.224	172.30.54.33 - 172.30.54.62

(ii)

5 marks



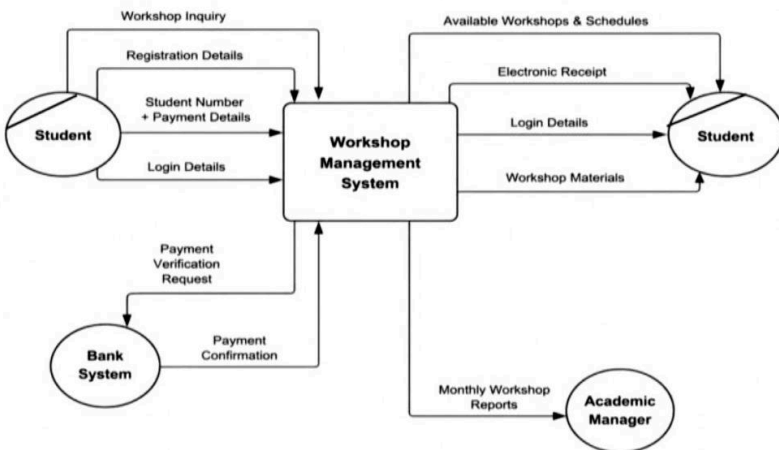
- 1 mark for Internet – Router – Firewall link
- 1 mark for properly connecting Proxy server
- 1 mark for interconnecting Switches of subnets through a L3 Switch or a Router
- 0.5 mark for connecting given no of computers to switches in each subnet
- 0.5 mark for connecting 2 network printers to Eng. Switch, 1 network printer to Arts switch and non-network printer to a computer in the Science switch
- 1 mark for connecting a DHCP Server to Eng. subnet

(iii)	A → UDP Because it requires fast, real-time delivery. Occasional data loss (e.g., skipped frames) is acceptable, but delays are not. B → TCP Because it requires reliable and complete data transfer. All files must be received accurately without loss. C → TCP Because student answers must be delivered correctly and securely with no data loss. 0.5 for the correct Protocol 0.5 for the justification (1 X 3 = 3 marks)	3 marks
7(a)(i)	A - Heart-rate Sensor B - Controller C - Arduino Board with Communication Module	1 ½
(a)(ii)	- the data flow is one-way: the system continuously sends (pushes) real-time heart-rate readings and alerts to the mobile application. - The nurse does not transmit control signals back to the sensor hardware in this setup, so there is no reverse data path. - The communication is purely from the monitoring system to the display/notification device.	1
(b)	X - H_R < 4 OR H_R > 6 Y - Turn Alarm ON (Set Alarm = ON) Z - Turn Alarm OFF (Set Alarm = OFF)	1 ½
(c)	- Room/ward ambient temperature — to ensure it remains within comfortable and safe limits for patients and medical equipment. - Patient body temperature (fever monitoring) — detecting hyperthermia by placing a sensor on/near the patient. - Medical equipment temperature — incubators, refrigerators storing medicines/blood, or sterilization units can be continuously monitored.	1
(d)(i)	The self-autonomous agents are Agent 2 and the Search Agent.	2

(ii)	- Interaction Q (Agent 1 → Agent 2): Agent 1 triggers Agent 2 by passing patient data or a request for analysis. This happens after Agent 1 receives information or instructions from a doctor/nurse. Q represents the delegation of analytical tasks from the communication agent to the analytical agent. - Interaction S (Search Agent → Agent 2): After the Search Agent has retrieved relevant treatment guidelines from the Internet, it sends those results back to Agent 2. S represents the return of external knowledge to the analytical agent so it can update the hospital database and make informed recommendations.	1 x 2 = 2 marks
(iii)	The system loses access to up-to-date medical knowledge from the Internet. Treatment guidelines, drug protocols, and medical research are continuously evolving; the hospital database will gradually become outdated. Without the Search Agent, Agent 2 can only reason from existing, potentially obsolete records, which may lead to missed diagnoses, outdated treatment recommendations, or failure to identify newly recognized medical conditions — potentially compromising patient safety.	2 marks
e (i)	It ensures that the hospital's appointment slots are reserved for patients who can realistically attend in person within a reasonable time. This reduces no-shows and last-minute cancellations, improves resource planning (staff, beds, equipment), and avoids overbooking due to remote patients who cannot reach the hospital quickly.	2 marks
(ii)	The hospital could use SMS/telephone confirmation: after a patient submits an appointment request online, the system sends a unique booking reference via SMS. The patient then pays at the hospital reception on arrival (cash or card) and presents the SMS reference. This ensures appointments are recorded digitally while deferring payment to the point of service until the online payment gateway is ready.	2 marks

8(a).	[1200.0, 850.0, 650.0, 1300.0] 4000.0	1x2 = 2 marks
(b).	Assumption: the two lists are of equal length and at least one item exists. <pre> def Expensiveltem(item_names, item_prices): ½ max_price = item_prices[0] ½ max_name = item_names[0] ½ for i in range(1, len(item_prices)): 1 if item_prices[i] > max_price: 1 max_price = item_prices[i] ½ max_name = item_names[i] ½ return max_name ½ </pre>	5 marks
(c)	<pre> Temp = [[180, 200, 190], [210, 205, 195], [175, 185, 220]] ½ # Find the highest temperature highest = Temp[0][0] ½ for row in Temp: 1 for temp in row: 1 if temp > highest: 1 highest = temp ½ # Display highest temperature print("Highest Temperature:", highest) 1 # Determine kitchen safety status if highest <= 220: 1 print("Kitchen Status: Safe") ½ else: ½ print("Kitchen Status: Danger") ½ </pre>	8 marks

9(a).(i).	<pre> erDiagram Bank --} Branch : has Branch --} Account : maintains Customer --} Account : opens Bank { string RegCode PK string BankName } Branch { string BranchNo PK string BranchName string Address } Customer { string NIC PK string Email string DOB string CusName string MobileNo PK string Address } Account { string AccNo PK string AccType string TimePeriod float Interest float DepositPrice string DepDate string MatureDate string OpenDate string AccountStatus } </pre>	5marks
(ii).	Bank (<u>RegCode</u>, BankName) Branch (<u>BranchNo</u>, BranchName, Address, RegCode) Account (<u>AccNo</u>, AccType, DepositPrice, TimePeriod, Interest, DepDate, MatureDate, BranchNo) Customer (<u>NIC</u>, CusName, DOB, Address, Email) CustMobile (<u>NIC</u>, <u>MobileNo</u>) Opens(<u>NIC</u>, <u>AccNo</u>, OpenDate, AccountStatus)	3marks (0.5x6)
(b).(i).	1. Update Anomaly 2. Insertion Anomaly 3. Deletion Anomaly 1. Update Anomaly If the manager Yasantha (E002) changes his name or phone number, it must be updated in multiple rows (LK120, LK170, UK57). If one row is missed, inconsistent data will exist. 2. Insertion Anomaly A new department or manager cannot be added unless there is a project record associated with it. For example, a new department cannot be stored without creating a project 3. Deletion Anomaly If project NZ78 is deleted, the information about manager Kumara (E006) and department details associated with that project may also be lost. 3 anomalies -1mark Explanation-1mark	2marks

(ii).	First Normal Form (1NF). • All attributes contain atomic (single-valued) data. • There are no repeating groups or multivalued attributes. • Each row represents a unique project record. However, the table is not in 2NF because some non-key attributes depend only on part of the key rather than the whole key. There for the relation contains partial dependencies, so it is only in 1NF. Normal form -1mark Explanation-1mark	2marks																		
(iii).	Project(PCode, PTitle, M_ID, MName, Budget) Employee(Empno, Empname, MobileNo, Depno, Depname) Project_Employee(PCode, Empno)	3marks																		
10 (a) (i)	 The diagram shows a central 'Workshop Management System' box. It interacts with three external entities: 'Student' (top left), 'Bank System' (bottom left), and 'Academic Manager' (bottom right). Data flows include: Student to System (Workshop Inquiry, Registration Details, Student Number + Payment Details, Login Details); System to Student (Available Workshops & Schedules, Electronic Receipt, Login Details, Workshop Materials); Bank System to System (Payment Verification Request, Payment Confirmation); and System to Academic Manager (Monthly Workshop Reports). <u>Context Diagram</u> <table border="1"> <thead> <tr> <th>Item</th> <th>Marks</th> </tr> </thead> <tbody> <tr> <td>System Name</td> <td>1</td> </tr> <tr> <td>Student Entity</td> <td>0.5</td> </tr> <tr> <td>Bank System Entity</td> <td>0.5</td> </tr> <tr> <td>Academic Manager Entity</td> <td>0.5</td> </tr> <tr> <td>Student-System Flows</td> <td>2</td> </tr> <tr> <td>Bank-System Flows</td> <td>1</td> </tr> <tr> <td>Academic Manager Flow</td> <td>0.5</td> </tr> <tr> <td>Total</td> <td>6</td> </tr> </tbody> </table> A student should receive marks only when: 1. Correct DFD symbol is used. 2. Correct name is given. Relevant data flows are connected correctly	Item	Marks	System Name	1	Student Entity	0.5	Bank System Entity	0.5	Academic Manager Entity	0.5	Student-System Flows	2	Bank-System Flows	1	Academic Manager Flow	0.5	Total	6	6 marks
Item	Marks																			
System Name	1																			
Student Entity	0.5																			
Bank System Entity	0.5																			
Academic Manager Entity	0.5																			
Student-System Flows	2																			
Bank-System Flows	1																			
Academic Manager Flow	0.5																			
Total	6																			

(ii)

7 marks

Component	Marks
Processes Relevant Data Flows (4 × 1 Mark)	4 Marks
Process 1.0 – Handle Registration	1
Process 2.0 – Handle Payments	1
Process 3.0 – Manage Workshop Materials	1
Process 4.0 – Generate Reports	1
Data Stores + Relevant Data Flows (3 × 1 Mark)	3 Marks
D1 Student Database + correct connections	1
D2 Workshop Database + correct connections	1
D3 Payment Database + correct connections	1
Total	7 Marks

(b).

- (i) Organizational Feasibility
- (ii) Technical Feasibility
- (iii) Operational Feasibility
- (iv) Economic Feasibility

$\frac{1}{2} \times 4 = 2$ marks



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