

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 } 12 Grade	විෂයය பாடம் } Information & Communication Technology Subject	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**.

1. According to the golden rule of information, the value of information is highest _____. What is the most suitable answer to fill the blank?
 - (1) when it is archived
 - (2) when it is processed multiple times
 - (3) at the moment it is created or released
 - (4) after verification
 - (5) when it is stored securely

2. A company processes real-time data from sensors in a smart city system. Which Big Data characteristic is MOST critical here?

(1) Volume	(2) Variety
(3) Velocity	(4) Veracity
(5) Value	

3. Why is validation important in data processing systems?
 - (1) It guarantees delivering 100% correct answer as output
 - (2) It reduce the input of incorrect data being processed
 - (3) It replaces verification process of the system
 - (4) It speeds up data entering to the system
 - (5) It eliminates all human errors

4. Entering student details into a system as they register is _____ A _____ processing. Generating monthly reports at the end of the month is _____ B _____ processing.
 What are the correct terms for A and B ?
 - (1) A – Batch, B – Real-time
 - (2) A – Real-time, B – Batch
 - (3) A – Online, B – Offline
 - (4) A – Offline, B – Online
 - (5) A – Manual, B – Automatic

5. Which of the following best describes Firmware?
 - (1) Software that runs only on the internet
 - (2) Software permanently embedded into hardware
 - (3) Software that can be easily removed by users
 - (4) Software used for word processing
 - (5) Software stored only in secondary storage

6. Which of the following best describes the digital divide?
 - (1) Difference between digital and analog systems
 - (2) Gap in access to ICT resources among different groups
 - (3) Difference in data transmission speeds
 - (4) Separation between hardware and software
 - (5) Inequality in data storage capacity

7. Why is Charles Babbage considered the “Father of the Computer”?
 - (1) He invented vacuum tubes, which were used in first-generation computers for processing data
 - (2) He created the Pascaline, an early mechanical calculator used for arithmetic operations
 - (3) He developed the first fully electronic digital computer capable of high-speed processing
 - (4) He followed the concept of input, processing, and output (IPO cycle) in computing systems
 - (5) He designed the Difference Engine, a mechanical general-purpose computing machine with features similar to modern computers

8. A company wants to convert printed text documents into editable digital text files. Which technology should be used?

(1) OMR	(2) MICR
(3) OCR	(4) Barcode Reader
(5) Flatbed Scanner	

9. Consider the following statements about Mainframe Computers:
 - A. They can support many users simultaneously
 - B. They are typically used as personal computers
 - C. They are large and expensive systems
 Which of the following is correct?

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

10. Consider the following statements about printers.
 - A. Impact printers are slower compared to most modern printers
 - B. Non-impact printers are less noisy.
 - C. Both types always print character-by-character
 Which of the following is correct?

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

11. Which of the following communication buses are used by the CPU to send the memory location of the instruction to be fetched?
- A. Address Bus
 - B. Control Bus
 - C. Data Bus
- (1) A only (2) B only
(3) C only (4) A and B only
(5) A, B and C
12. Which of the following is a limitation of parallel computing?
- (1) Tasks always execute faster regardless of the complexity or dependency between processes
 - (2) Tasks cannot be stored in memory or managed efficiently during execution
 - (3) Tasks cannot always be divided into smaller independent parts suitable for parallel processing
 - (4) It requires no computational resources such as processors or memory to perform operations
 - (5) It completely eliminates all types of errors that may occur during processing
13. Convert 101.010_2 into decimal
- (1) 5.0125 (2) 5.25 (3) 5.12
(4) 0.125 (5) -5.25
14. A 4bit ALU which is based on one's complement arithmetic is used to do the following addition. $1101+1011$. The answer should be;
- (1) -7 (2) -6 (3) 6
(4) 7 (5) 24
15. Binary representations of some English words using the 7-bit ASCII coding system are given below.
Whole White
- 01110111 01101000 01101111 01101100 01100101 00100000 01110111 01101000 01101001 01110100 01100101
- Hexadecimal representation of the above is;
- (1) 77 68 6F 6C 65 77 68 69 74 65 (2) 77 68 6F 6C 65 20 77 68 69 74 65
(3) 77 68 6F 6C 65 20 69 74 65 69 74 (4) 77 68 6F 6C 65 69 74 6F 6C 65
(5) 77 68 6F 6C 65 69 74 20 77 68 69
16. Least significant digit in 476.022_{10} is ;
- (1) 4 (2) 0 (3) 6
(4) 7 (5) 2
17. The decimal value represented by 8 bit two's complement number 11101101 is,
- (1) 11101100 (2) 00010011 (3) 236
(4) -236 (5) -19

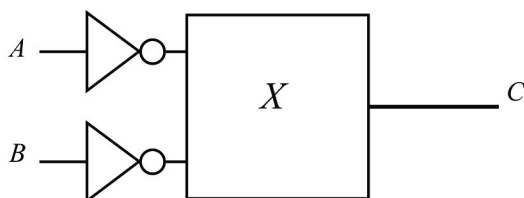
18. Which of the following statements regarding the characteristics of SRAM and DRAM within a computer system is correct?

- (1) DRAM is significantly faster than SRAM
- (2) SRAM can be used for main memory
- (3) DRAM can be used for main memory
- (4) SRAM and DRAM are non-volatile storage mediums
- (5) SRAM needs frequent refresh.

19. Considering all three options

- A. A and B are inputs to two NOT gates.
- B. The outputs of these NOT gates are then given as inputs to a logic gate X.
- C. The output of gate X is C.
- D. Gate X can be NAND, NOR, or XOR.

Which of the following gate(s) can be used as X so that the output $C = 0$ when both inputs to X (i.e., outputs of the NOT gates) are 0?



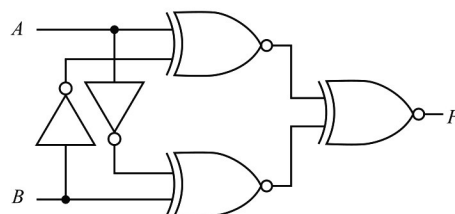
- (1) NAND only
- (2) NOR only
- (3) XOR only
- (4) All three (NAND, NOR, and XOR)
- (5) NOR or NAND only

20. Which of the following is the most simplified form of $A(\overline{BC}) + B\overline{C} + \overline{A}BC + BC$?

- (1) $A + B$
- (2) $\overline{B}(A\overline{C} + \overline{A}C) + B$
- (3) $\overline{C}(A\overline{B} + B) + C(\overline{A}B + B)$
- (4) $A\overline{C} + \overline{A}C + B$
- (5) $\overline{A}\overline{C} + B$

21. What is the output of the logic circuit shown in the figure?

- (1) 0
- (2) 1
- (3) A
- (4) B
- (5) $A + B$



22. Only a 2-input NAND gate is provided to represent the Boolean expression If $F = (\overline{X} + \overline{Y})(Z + W)$, how many gates are required for a solution with minimal cost?

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

23. Consider the Karnaugh-map shown here. Which of the following is the correct simplified logical expression corresponding to the groups shown in the Karnaugh map?

- (1) $B\bar{D} + BD$ (2) $\bar{B}\bar{D} + BD$
 (3) $A\bar{C} + \bar{A}C$ (4) $B + D$
 (5) $(\bar{B} + \bar{D})(B + D)$

$\begin{matrix} AB \\ CD \end{matrix}$	00 AB	01 $A\bar{B}$	11 $\bar{A}\bar{B}$	10 $\bar{A}B$
00 CD	0	1	1	0
01 $C\bar{D}$	1	0	0	1
11 $\bar{C}\bar{D}$	1	0	0	1
10 $\bar{C}D$	0	1	1	0

24. A digital circuit produces an output $F = 1$ only when, exactly one of the inputs A or B is 1, AND input C is 1. Which of the following Boolean expressions correctly represents this system?

- (1) $F = (A + B)C$ (2) $F = (AB)C$
 (3) $F = (A \oplus B)C$ (4) $F = (A + B) + C$
 (5) $F = (\bar{A}\bar{B})C$

25. A security system activates an alarm ($F = 1$) when:

- Sensor X is OFF (0), AND either Y is ON (1) OR Z is OFF (0) Which of the following logic expressions represents the system?

- (1) $F = X(Y + Z)$ (2) $F = \bar{X}(Y + \bar{Z})$
 (3) $F = \bar{X}(Y\bar{Z})$ (4) $F = (X + Y)(\bar{Z})$
 (5) $F = \bar{X}Y + \bar{Z}$

26. The block size of a disk is 2KB. A portion of its FAT is given below. The blocks belong to two files: data1.bin and data2.bin. Which of the following correctly gives the directory entry and allocated disk space for data1.bin and data2.bin respectively?

Block	Value
50	51
51	-1
52	53
53	54
54	-1
55	

- (1) data1: 50, 4KB data2: 52, 6KB (2) data1: 52, 6KB data2: 50, 4KB
 (3) data1: 50, 2KB data2: 52, 4KB (4) data1: 51, 2KB data2: 54, 2KB
 (5) data1: 52, 4KB data2: 50, 6KB

27. The function of the Memory Management Unit (MMU) is to:

- (1) Execute arithmetic and logical operations required for processing data within the central processing unit
- (2) Manage input and output operations by coordinating communication between external devices and the processor
- (3) Translate virtual memory addresses into corresponding physical memory addresses during program execution
- (4) Store instructions temporarily in memory while programs are being processed by the system
- (5) Control system security policies by managing access permissions and protecting system resources

28. Which of the following statements about the swapping technique in an operating system are correct?

- A. Swapping involves moving processes temporary between main memory (RAM) and virtual memory.
- B. Swapping helps to increase the degree of multiprogramming.
- C. Swapping involves moving a process permanently from main memory to virtual memory.

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

29. Which of the following is the most common real-world example of spooling technique operating system?

- (1) Saving a file to a USB drive
- (2) Loading a webpage from the internet
- (3) Running multiple programs simultaneously using multitasking
- (4) Sending multiple print jobs to a printer
- (5) Defragmenting the hard disk to improve read speed

30. Which scheduler is responsible for deciding which process is moved from the job pool into the ready queue, thereby controlling the degree of multiprogramming?

- (1) Short-term scheduler
- (2) Medium-term scheduler
- (3) Long-term scheduler
- (4) CPU dispatcher
- (5) I/O scheduler

31. During a context switch, why is the PCB essential?

- (1) It deletes the old process from memory so the new process can use all available RAM
- (2) It transfers the process directly from one CPU core to another without any delay
- (3) It compresses the process state to save memory while another process runs
- (4) It saves the current process state (registers, program counter, etc.) so execution can be accurately resumed later
- (5) It notifies all other processes that the CPU is now being used by a different process.

32. A system uses a logical address space of 16 bits. The page size is 1 KB.

What are the number of bits in the page number and the offset?

- (1) Page number = 6 bits, Offset = 10 bits
- (2) Page number = 10 bits, Offset = 6 bits
- (3) Page number = 8 bits, Offset = 8 bits
- (4) Page number = 4 bits, Offset = 12 bits
- (5) Page number = 12 bits, Offset = 4 bits

33. Which of the following is a major drawback of linked allocation in file systems?

- (1) It wastes memory due to unused spaces within blocks
- (2) It requires a large amount of contiguous disk space
- (3) It has overhead due to storing pointers in each block
- (4) It does not allow files to grow dynamically
- (5) It provides very fast direct access to any block

34. Which of the following statements about the seven-state process model are correct?

- A. A process in the *Blocked* state can move directly to the *Running* state when the required event occurs.
- B. A process in the *Ready Suspended* state must first be moved to the *Ready* state before it can be executed.
- C. A process in the *Running* state can be moved to the *Blocked Suspended* state if it requires an I/O operation and is swapped out.

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

35. Frequency of a signal is defined as:

- (1) The maximum amplitude is the highest point of a waveform from its equilibrium position.
- (2) The number of complete oscillatory cycles of a periodic signal that pass a fixed reference point per unit time.
- (3) The vertical height of the waveform measured from the equilibrium position, showing the strength or intensity of the signal
- (4) The position of a point within a wave cycle at a given moment.
- (5) The speed at which the signal travels through a transmission medium, representing how fast the signal propagates

36. Consider the following statements about noise, attenuation and distortion.

- A. Noise is unwanted signal that affects transmission
- B. Distortion means change of signal shape
- C. Attenuation means delay in transmission

Which of the above statements are correct?

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

37. Consider the following statements regarding data transmission and layer responsibilities in the TCP/IP model:

- A. Point-to-point delivery happens at the Data Link layer, where switches use MAC addresses to forward packets between nearby devices.
- B. End-to-end communication is handled by the Transport layer using protocols like TCP for reliable data transfer.
- C. UDP guarantee packet order or reliability during transmission.

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

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

38. Which of the following statements about the Public Switched Telephone Network (PSTN) are **incorrect**?

- A. PSTN is a circuit-switched network that establishes a dedicated communication path between two users during a call.
- B. PSTN primarily uses packet switching to transmit voice data efficiently over digital networks.
- C. PSTN can carry both analog and digital signals, depending on the part of the network being used.

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

39. Which of the following correctly distinguishes guided and unguided transmission media?

Which of the following statements correctly describes guided and unguided transmission media?

- (1) Guided media always has higher bandwidth than unguided media.
- (2) Unguided media includes coaxial cables, twisted pair, and optical fiber.
- (3) Guided media cannot cover long distances without repeaters, whereas unguided media can transmit unlimited distances.
- (4) Unguided media is completely free from electromagnetic interference.
- (5) The guided media is not fast, while the unguided media is fast.

40. Which network device operates on MAC addresses?

- (1) Hub
- (2) Router
- (3) Repeater
- (4) Modem
- (5) Switch

41. A school wants to set up a network with the following requirements: easy installation, less cost, ability to add new computers without disrupting the network, and centralized management. Which topology is most suitable?

- (1) Bus Topology
- (2) Ring Topology
- (3) Tree Topology
- (4) Mesh Topology
- (5) Star Topology

42. What is the main usage of port numbers in networking?

- (1) Port numbers identify applications or services on a device.
- (2) Port numbers assign unique IP addresses to devices.
- (3) Port numbers determine the physical path of network cables.
- (4) Port numbers increase the signal strength of data.
- (5) Port numbers encrypt data for secure communication.

43. In the context of ALOHA and its improvement to Ethernet, what was the key innovation introduced by Ethernet (Carrier Sense Multiple Access with Collision Detection – CSMA/CD) that improved upon pure ALOHA?

- (1) It required all devices to transmit at fixed time slots.
- (2) It allowed devices to transmit simultaneously without any restrictions.
- (3) It introduced a central controller to grant permission to transmit.
- (4) It allowed devices to detect and reduce collisions during transmission.
- (5) It eliminated the need for acknowledgements completely.

44. A company has been allocated the IP address 172.25.0.0/16. They need to create subnets to support exactly 500 usable hosts per subnet. What is the most appropriate subnet mask to use?

- (1) 255.255.192.0
- (2) 255.255.244.0
- (3) 255.255.254.0
- (4) 255.255.255.254
- (5) 255.255.255.128

45. Given the network 192.168.10.12/22, which of the following is a valid subnet ID within this network?

- (1) 192.168.8.0
- (2) 192.168.10.0
- (3) 192.168.11.128
- (4) 192.168.14.0
- (5) 192.168.15.255



Conceder following Scenario

In Library Management System, the core process handles everything from checking book availability to manage loans and fines; usually include the processes such as Manage Books (Adding / removing titles from the inventory), Search/Inquiry (Checking if a book is available), Issue / Return (Handling the actual borrowing transaction), Manage Fines (Calculating penalties for late returns).

46. In a Level 1 Data Flow Diagram for a Library Management System, described above, which of the following would be considered a Data Store?

- A. Member
- B. Book
- C. Issue Book
- D. Generate Fine Report

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

47. Which statement correctly distinguishes Agile from Waterfall?

- (1) Agile is iterative and flexible, Waterfall is linear and sequential
- (2) Agile ignores user feedback, while Waterfall emphasizes it
- (3) Agile cannot be used for software projects, Waterfall can
- (4) Waterfall uses prototyping extensively, Agile never does
- (5) Agile and Waterfall are identical in approach and principles

48. Which of the statements are correct regarding documentation within the System Development Life Cycle (SDLC):

- A. Documentation is essential during system analysis
- B. Documentation is essential during system development
- C. Documentation is essential during system design
- D. Documentation is essential during Review and Maintenance

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

49. Which statement describes the following component used in SSADM?

D3	Book
----	------

- (1) Manual 3rd Data store, can be used in context diagram
- (2) Digital 3rd data store, can be used in L1 DFD
- (3) Temporary 3rd data store, can be used in L1 DFD
- (4) Digital 3rd process can be used in context diagram
- (5) Digital 3rd process can be used in L1 DFD

50. Which of the following is a non-functional requirement for a modern air conditioning system?

- (1) The unit must allow the user to schedule "On/Off" times via a mobile app.
- (2) The system must automatically switch to "Dry Mode" when humidity exceeds 60%.
- (3) The outdoor compressor unit must have a mean time between failures $\geq 5,000$ hours.
- (4) The indoor unit must be equipped with a concealed LED display that clearly and accurately shows the current room temperature to the user when activated.
- (5) The system must provide a "Turbo" setting to reach the target temperature faster.

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බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
 மேல் மாகாண கல்வித் திணைக்களம் மேல் மாகாண கல்வித் திணைக்களம் மேல் மாகாண கல்வித் திணைக்களம்
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තෙවන වාර පරීක්ෂණය
 மூன்றாம் தவணைப் பரீட்சை - 2026
 Third Term Test

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

20 E II

පැය තුනයි
 மூன்று மணித்தியாலம்
 Three hours

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 தரம் }
 Grade }

අමතර කියවීමේ 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)** A supermarket billing system scans items and calculates the total bill. One instruction in the program is:

“LOAD price from memory location 200, ADD price from location 201, and STORE the result in location 300.”

- (i). Using the given instruction, describe step by step how the CPU fetch execution Cycle carries out the operation.

- (ii). How the speed of registers affects the performance of the fetch-execute cycle.

- (iii). Write one problem that may occur if there is a delay in transferring data between memory and CPU

- (b) State two advantages of the NTFS file format for operating systems.

- (c) Explain the function of POST (Power-On Self-Test) in the booting process.

2. (a) (i). State one reason why encoding is necessary in data communication. (01 mark)

(ii). Draw the complete Manchester encoded waveform for 01100101. (01 mark)

(b) (i). What are the 3 Transmission Impairments? (0.5X 3=1.5 marks)

(ii). Calculate the parity bit for the following data bytes using even parity. (0.5 X 2=1 mark)

Data	Parity Bit
------	------------

1101010	
---------	--

1111111	
---------	--

(c) The branch office building is located 2 km away from the company's main data center. The network infrastructure must support the following requirements:

Requirement 1: High-speed data transfer (minimum 1 Gbps) between the branch office and the main data center.

Requirement 2: Immunity to electromagnetic interference caused by heavy machinery in the industrial area.

Requirement 3: Secure transmission to prevent data interception.

Requirement 4: Inside the branch office, 50 desktop computers need to be connected to a central switch.

- (i) Identify the most suitable transmission medium for connecting the branch office to the main data center (2 km distance). Justify your choice by explaining how it meets Requirements 1, 2, and 3. (1.5x 3= 4.5 marks)

	Transmission medium	Justification
Requirement 1:		
Requirement 2:		
Requirement 3:		

- (ii) For the internal network within the branch office (50 desktop computers connected to a central switch): Identify the most suitable transmission medium and explain why it is appropriate for this scenario. (0.5x 2=1 marks)

	Transmission medium	Justification
Requirement 4:		

- 3.** (a) Mention whether the following statements are True or False: (0.5x 4 = 2 marks)

- ASCII uses only 7 bits for standard encoding, but extended versions use 8 bits to represent additional characters. ()
- Unicode uses a 16 bits to represent characters in encoding format. ()
- EBCDIC is not compatible with ASCII-based systems and represents characters using 8 bits. ()
- Binary Coded Decimal wastes storage space compared to binary representation when storing large numbers. ()

- (b) Mention how many bits are used to represent text 𐀀𐀁𐀂 in main memory of a computer using UNICODE. (1 marks)

- (c) Mention the MSD and LSD of $3A8_{16}$ (0.5x 2 = 1 marks)

(d) Show how 231.125_8 is converted into a; ($0.5 \times 2 = 1$ marks)

(i) Binary number

(ii) Hexadecimal number

(e) Show that the answer to the Boolean expression $A + (\overline{B}A)$ is “1” when simplified. The steps and theorems used to simplify the expression should be clearly stated.(3 marks)

(f) Convert this product of sum(POS) = $(\overline{A} + B + \overline{C})(A + B + \overline{C})(A + \overline{B} + \overline{C})$ Boolean expression to sum of product(SOP) expression (2 marks)

4. The details of the *Flowing University Registration System* have been provided by the university to the system analysis team of a software company for system development.

University Registration System

- Students submit registration forms (name, NIC, course selections) to the Receptionist, who verifies each course's availability against the university's course file and determines accepted/rejected selections, forwarding results to the Academic Clerk.
- The Academic Clerk enrolls accepted students, updates the course file (recalculating class sizes and flagging courses as closed when full), and records new students in the student master file.
- Finally, the Registrar checks the master file and sends each student a confirmation letter listing registered courses and any unfulfilled selections.

- (a) Based on the given requirements, analyze the system and draw the **Level 1 Data Flow Diagram (DFD)**. Your diagram should include only the relevant **flowing external entities and processes**, and must also include the necessary **data stores and data flows**.

Entity: Student

Process: 1. Receptionist - Verify course availability
2. Academic Clerk - Enroll students, update files
3. Registrar - Send confirmation letter

- (b) It has been decided to deploy this system using a direct implementation approach instead of a parallel implementation. Do you agree with this decision? Provide one reason to justify your answer. (2 marks)

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மேல் மாகாணக் கல்வித் திணைக்களம்
Department of Education - Western Province

තෙවන වාර පරීක්ෂණය
மூன்றாம் தவணைப் பரீட்சை - 2026
Third Term Test

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தரம் } 12
Grade }

විෂයය }
பாடம் } Information &
Subject } Communication Technology

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வினாத்தாள் } II
Paper }

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மணித்தியாலம் } 3
Hours }

* Answer any **four** questions only.

Part B

5. (a) Show that $AB + \bar{A}C + BC.1 = AB + \bar{A}C$ using Boolean algebraic laws. (4 marks)

(b) A smart security system in a laboratory uses three sensors:

- A. Door sensor (1 = door closed, 0 = door open)
- B. Motion sensor (1 = motion detected, 0 = no motion)
- C. Alarm switch (1 = ON, 0 = OFF)

The system produces an output (F) equal to 1 only when:
the door is closed or no motion is detected and motion is detected or the alarm switch is ON.

- (i) Construct the truth table for the given system. (0.25 x 8 = 2 marks)
- (ii) Write the Boolean expression in Product of Sums (POS) form using the truth table.(2 marks)
- (iii) Using a K-map, simplify the expression in POS form. (4 marks)
- (iv) Draw the logic circuit for the expression obtained above using NOR gates only. (3 marks)

- 6. (a) (i) Mobile devices can connect to wireless networks at public Wi-Fi hotspots. When a device connects to a hotspot it needs an IP address.IP addresses can be static or dynamic.Explain why a mobile device should be allocated a dynamic IP address.(2 Marks)
- (ii) The mobile device will send its media access control (MAC) address to the hotspot. State why the MAC address is used in making the connection.(2 Marks)

- (b) A company is assigned the network 192.168.10.0/23. They have 6 departments, each with different host requirements as follows.

Department	Required Hosts
IT (Main)	100 hosts
Finance	40 hosts
Marketing	35 hosts
HR	30 hosts
Sales	25 hosts
Management	20 hosts

- (i). IT department acts as Main switch. It Connects to the Internet, and has Hosts such as DNS Server ,Proxy Server. All departments must be in separate subnets and communicate through the IT core network. Use VLSM (Variable Length Subnet Masking) for efficiency. Allocation of subnets should be done according to the given order of departments given in the table below. Copy the table and complete all details. (6 marks)

Department	Network ID	Broadcast ID	Subnet Mask	Usable Host IP Range

- (ii). Describe how the proxy server can improve network performance for repeated website access.(1 mark)
- (iii). What problem would users face if the DNS server is unavailable?(1 mark)
- (iv). Suggest the most suitable location to place the DHCP server in this network and state the reason for your suggestion. (1X 2 =2 marks)

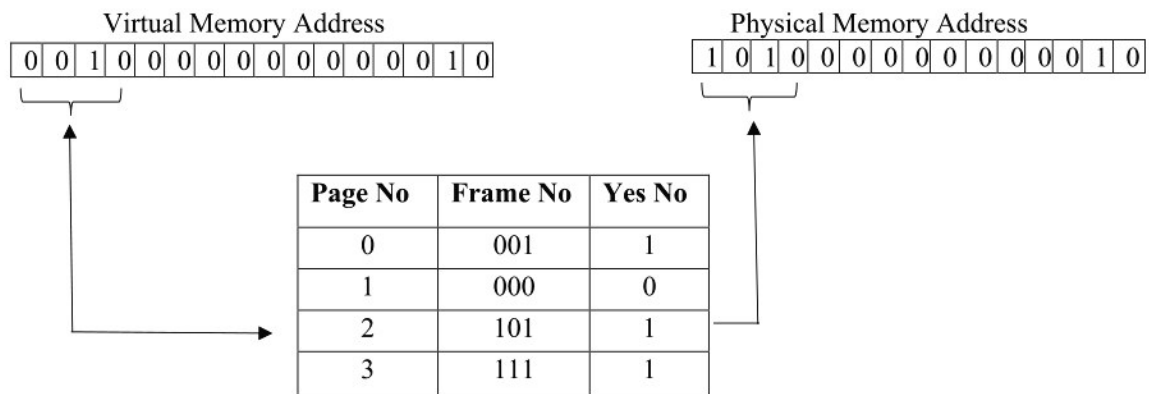
7. (a) State two advantages and two disadvantages of spooling in an operating system?(2 x2 = 4 marks)

(b) Assume a 32KB program is run on the computer, The page table of this process at a particular time is given below.

- The frame number is defined in binary
- Virtual addresses on page 0 are from 0 to 4095 and on page 1 are from 4096 to 8191.
- Yes /No field displays the availability of a process.
- If bit is 1, process is valid and usable.
- If bit is 0, virtual address is not available in the physical memory.

Assume the virtual address 0001 0000 0000 0010 given to execute the following process. Operating system changes the state of Yes/No field in the page number 3 from bit 1 to 0.

(i) Change the diagram below according to the given virtual address.



- (ii) Which pages are currently in physical memory? (3 marks)
- (iii) What happens if page 1 is accessed? (3 marks)
- (iv) Define page fault and explain when it occurs. (3 marks)
- (v) Assume this program requires accessing virtual address 15400 .To which physical address will it get transformed to? (2 marks)

(c) Identify the terms A and B for the following blanks. (0.5x2 = 1 mark)

In asymmetric encryption, the sender uses the _A_____ key to encrypt data, and the receiver uses the ___B_____ key to decrypt it, ensuring secure communication over an untrusted network.

8. (a) The following describes a scenario of an e-Health Appointment and Treatment System for a physician.

A patient can access the system by visiting the website and entering the required personal and medical information. The entered information is analyzed and stored in the patient information file. Subsequently, a booking number is generated and issued to the patient, and this number is recorded in the booking file.

Alternatively, when a patient contacts the receptionist via telephone and provides the necessary details, the receptionist enters the patient information into the system. The receptionist is also responsible for handling booking cancellations by entering the relevant cancellation details. As a result, both the patient information file and the booking file are updated accordingly.

The system then retrieves the relevant patient and booking information from the respective files and forwards it to the physician. Based on this information, the physician enters the prescription into the system, which is subsequently transmitted to the patient.

- (i) Construct a context diagram (Level 0 DFD) using standard symbols. (7 mark)
- (ii) Write three functional requirements for the described e-Health Appointment and Treatment System, following IEEE standards. (3 marks)
- (iii) Propose two non-functional requirements for the described e-Health Appointment and Treatment System. (2 marks)

- (b) The following table illustrates the documents being passed within a School Student Information System.

Source	Document	Receiver
Deputy Principal	Character Certificate	Student
Deputy Principal	Student Details	School Management
Parent	Application for Student Admission	Deputy Principal
Deputy Principal	Student Admission Documents	Principal
Principal	Student Evaluation Report	Student
Principal	Leaving Certificate	Parent

Draw a document flow diagram related to the table given above. (3 marks)

9. (a) A school is setting up a new computer lab for students to learn ICT and multimedia applications.

- (i) The school needs computers for applications such as typing documents and programming. Identify the type of computer based on purpose. (1 mark)
- (ii) The school decides to purchase desktop computers for students. Name the classification based on size that includes desktop computers. (1 mark)
- (iii) Students need to enter data and view results while working. Name one input device and one output device suitable for this purpose. (1 mark)
- (iv) The school replaces older devices with modern ones. State two advantages of modern input/output devices compared to older devices. (1 mark)

(b) A student is learning how a computer executes programs. While running a simple program, the student observes that both instructions and data are stored in the same memory and processed step by step by the CPU.

- (i) Identify the type of computer architecture described above and state one key feature of it. (0.5x2 = 1 mark)
- (ii) During execution, the CPU performs different functions. Name the main components of the CPU and state their roles. (2 marks)
- (iii) State whether a single-core processor or a quad-core processor is suitable for a system when running multiple applications. Justify your answer. (2 marks)

(c) A student is using a computer to run multiple applications and save important files. The student notices that the system loses unsaved data after a power failure but can still access saved files when restarted. The system also runs faster when frequently used programs are opened.

- (i) Identify the type of memory that loses data when power is switched off and give two examples. (2 marks)
- (ii) The student learns that the main memory has different types. Name two types of RAM and state one difference between them. (2 mark)
- (iii) The system contains memory that stores permanent instructions needed for booting. Name the type of memory used here. (1 mark)
- (iv) Frequently used programs open faster than others. Identify the type of memory responsible for this. (1 mark)

10. (a) (i) Determine whether 1101_2 represents a valid BCD value and justify your answer. (2 mark)

(ii) A programmer has an 8-bit unsigned integer $A = 11010110$. She performs the following operations sequentially:

Step 1 - Left shifts A by 2 positions.

Step 2- Applies a bitwise XOR with mask 10101100 .

Step 3 - Performs a bitwise AND with mask 11110011 .

Step 4 - Finally, right shift the result by 1 position.

Find the final 8-bit binary result and the bitwise operator/s which loses information in this sequence.

(b) A digital system stores integer values using two's complement representation. Answer the following:

- (i) If the device displays the 8-bit binary number 11101100 , determine the decimal value entered to the system and state whether it is positive or negative.
- (ii) Show how the decimal number 22 would be represented in this system.
- (iii) Describe the process of adding 22 to the number from part (i) using two's complement arithmetic, and provide the resulting binary and decimal values.
- (iv) Suppose the result of part (iii) is added to -50. Determine whether an overflow occurs in 8-bit two's complement arithmetic, and explain how you detect overflow.