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බස්නාහිර පළාත් අධ්‍යාපන දෙපාර්තමේන්තුව
 மேல் மாகாண கல்வித் திணைக்களம்
 Western Province Education Department
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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

ශ්‍රේණිය } 12
 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)

- (i). ASCII uses only 7 bits for standard encoding, but extended versions use 8 bits to represent additional characters. ()
- (ii). Unicode uses a 16 bits to represent characters in encoding format. ()
- (iii). EBCDIC is not compatible with ASCII-based systems and represents characters using 8 bits. ()
- (iv). 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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மூன்றாம் தவணைப் பரீட்சை - 2026
Third Term Test

தரம் } 12
Grade }

විෂයය } Information &
 பாடம் } Communication Technology
 Subject }

பொது
வினாத்தாள் } II
Paper

பேடி
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)
-
- (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)

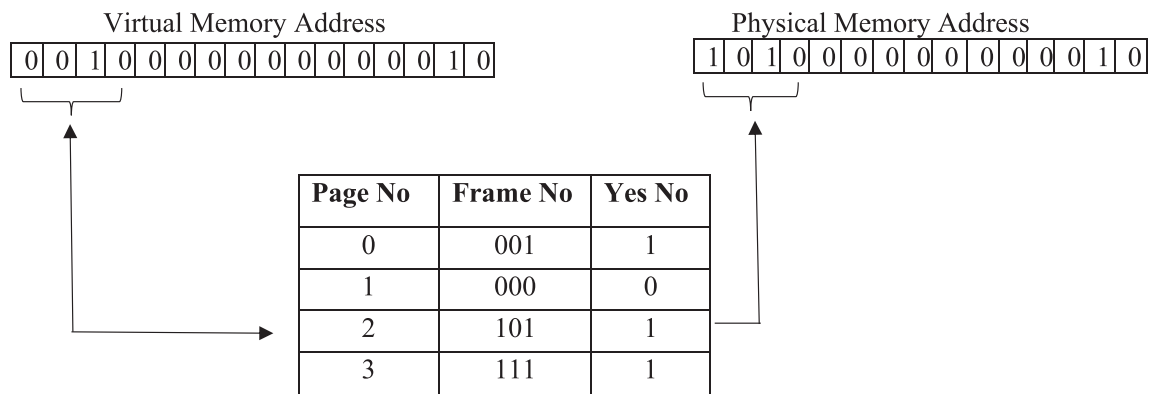
7. (a) State two advantages and two disadvantages of spooling in an operating system?(2 x2 = 4 marks)

(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.