



Date: 30-03-2026

GAUHATI UNIVERSITY
CENTRE FOR DISTANCE AND ONLINE EDUCATION
HOME ASSIGNMENT

Master of Science in Information Technology (M.Sc.-IT)
Semester - I (Session: 2025-26 (January))

Guidelines for Submission:

1. Learners who have been admitted in the Academic Session (2025-26 (January)) will write the Home Assignment.
2. Learners should write their **Roll Number, GU Registration Number, Subject, Semester, Paper Title, Paper Code** and **Name of the Study Center** clearly on the first page of the answer script in the space provided.
3. The formats of the answer scripts are available at and can be downloaded from, the GUCDOE website (www.gucdoe.in).
4. There will be 2 (two) compulsory questions in each paper, and each question will have options (Total Marks: 2 questions × 10 marks= 20 marks).
5. **Typed/Computerized answers will not be accepted.** Learners will write the answers neatly in their own handwriting.
6. Learners should not submit any plagiarized answers as such a practice is deemed to be unfair.
7. Learners of different Study Centers under GUCDOE will mandatorily submit the answer scripts at their respective Study Centers.
8. Learners of GUCDOE center will submit their answer scripts at GUCDOE Office.
9. **Last Date of Submission : 30th April, 2026.**

PAPER: INF 1016 (ADVANCED CONCEPTS IN OBJECT ORIENTED PROGRAMMING)

Answer the following questions **2 x 10 = 20**

Q. No. 1. Explain any situation where Hybrid inheritance is required to be implemented. Write C++ program to show the implementation of Hybrid Inheritance. **10**

OR

Explain the importance of Inheritance with appropriate examples. Why multiple inheritance is not supported in JAVA? **10**

Q. No. 2. Explain with appropriate examples, different fundamental steps to design a system using Object-Oriented process. **10**

OR

Write a C++ program to overload % (modulus) operator using friend function and explain the program. **10**

PAPER: INF 1026 (ADVANCED COMPUTER ORGANIZATION AND ARCHITECTURE)

Answer the following questions **2 x 10 = 20**

Q. No. 1. Define the concept of Addressing Mode. Contrast Direct Addressing and Register Indirect Addressing, explaining the advantages and disadvantages of each in terms of execution speed and memory access flexibility. **10**

OR

Compare and contrast the three primary cache mapping schemes: Direct Mapped, Set-Associative, and Fully Associative. Discuss the trade-offs of each in terms of hardware complexity (comparators needed) and vulnerability to conflict misses. **10**

Q. No. 2. Differentiate between the Write-Through and Write-Back cache policies. Discuss the primary advantage of each policy and explain why a Write-Back policy introduces the need for a Dirty Bit in the cache block structure. **10**

OR

Explain why Register Renaming is an indispensable technique for enabling efficient Out-of-Order Execution. Clearly describe how renaming solves false data dependencies (specifically WAR and WAW hazards) by separating the architectural register names from the physical storage locations. **10**

PAPER: INF 1036 (OPERATING SYSTEM)

Answer the following questions

2 x 10 = 20

Q. No. 1. How can you solve Producer consumer problem using Sleep () and Wakeup () system calls? **10**

OR

Consider the reference string 0,3,0,4,5,3,2,0,5,4,6,7,3,4. Find the number of Page faults in each of the following cases assuming that memory can accommodate 4 pages/frames at a time.

5 + 5 = 10

(i) FIFO Page Replacement

(ii) LRU Page Replacement

Q. No. 2. How Daisy chain is used to handle interruptions? Explain the procedure to make a priority base daisy chain with a block diagram. **5 + 5 = 10**

OR

Explain the function of DMA (Direct Memory Access). Why DMA data transfer is necessary? **5 + 5 = 10**

PAPER: INF 1046 (MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE)

Answer the following questions

2 x 10 = 20

Q. No. 1. With the help of truth table of Conjunction and Disjunction operation, verify De Morgan's Laws **10**

OR

A survey of 50 students shows:

- 28 like Mathematics
- 22 like Science
- 12 like both Mathematics and Science

a) Analyze the data and construct a two-set Venn diagram.

b) Determine how many students like only one subject and how many like neither subject.

c) Explain the steps you followed during the construction of the diagram and justify your method.

2 + 4 + 4 = 10

Q. No. 2. Which of the following relations is symmetric but neither reflexive nor transitive for a

set $A = \{1,2,3\}$

10

a) $R = \{(1,2),(1,3),(1,4)\}$

b) $R = \{(1,2),(2,1)\}$

c) $R = \{(1,1),(2,2),(3,3)\}$

d) $R = \{(1,1),(1,2),(2,3)\}$

OR

a) $L = \{w \in \{0,1\}^* \mid w \text{ does not contain the substring "10"}\}$.

- Draw the state diagram for this DFA.
- How many states does the resulting minimal DFA have?
- What is the regular expression for this language?

b) $L = \{w \in \{0,1\}^* \mid w \text{ has an even number of 0s OR an odd number of 1s}\}$

- Draw the state diagram for this DFA
- How many states does the resulting minimal DFA have?

List the pair of conditions that define the accepting states.

5 + 5 = 10

PAPER: INF 1056 (ADVANCED DATABASE MANAGEMENT SYSTEM)

Answer the following questions

2 x 10 = 20

Q. No. 1. Briefly explain normalization in Database Management System (DBMS) with its advantages and disadvantages. Describe each normal form in DBMS with proper examples and explanations. **10**

OR

Explain the different normal forms (1NF, 2NF, 3NF, and BCNF) with suitable examples. How does normalization reduce data redundancy and improve database design? **10**

Q. No. 2. State the need for concurrency control in DBMS. Discuss five concurrency control problems with appropriate examples. **10**

OR

Explain the key components of an Entity-Relationship (E-R) diagram, including entities, attributes, and relationships. How is the E-R model used in database design? Illustrate with a detailed example. **10**

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