

**BACHELOR OF TECHNOLOGY (CBCS - 2023)**  
**B. Tech. Sem-II Computer Science & Engineering : WINTER: 2025**  
**SUBJECT: DISCRETE MATHEMATICAL STRUCTURES**

Day : Friday  
Date : 28/11/2025

W-27696-2025

Time : 10:00 AM-01:00 PM  
Max. Marks : 60

**N.B.**

- 1) All questions are **COMPULSORY**.
- 2) Figures to the **RIGHT** indicate **FULL** marks.
- 3) Assume suitable data **WHEREVER** necessary.
- 4) Draw neat diagrams **WHEREVER** necessary.

**Q.1** Let P and Q be the propositions: (10)

p: I bought a lottery ticket this week

q: I won the million dollar jackpot on Friday

Express each of these propositions as an English sentences:

- a)  $\sim p$                       b)  $p \vee q$                       c)  $p \rightarrow q$   
d)  $p \wedge q$                       e)  $p \leftrightarrow q$                       f)  $\sim p \rightarrow \sim q$   
g)  $\sim p \wedge \sim a$                       h)  $\sim p \vee (p \wedge q)$

**OR**

**Q.1** Explain the first order logic (predicate logic) in detail. What is predicate and quantifiers? Explain with suitable examples. (10)

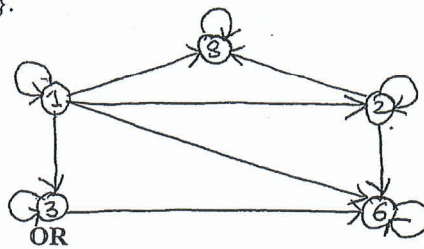
**Q.2** Explain following Rules of Inferences for propositional logic: (with the help of suitable example) (10)

- |                             |                           |
|-----------------------------|---------------------------|
| i) Modus ponens             | ii) Modus tollens         |
| iii) Hypothetical syllogism | iv) Disjunctive syllogism |
| v) Resolution               |                           |

**OR**

**Q.2** What is multi-set? Explain operations on multiset with suitable examples. (10)

**Q.3** What is Hasse Diagram? Explain how to draw a Hasse diagram step by step from given graph where  $A = \{1, 2, 3, 6, 8\}$ . (10)



**OR**

**Q.3** Explain Pigeonhole principle with suitable diagrams along with different cases. Also state various applications of pigeonhole principles. (10)

**Q.4** Explain following Algebraic structures: (10)

- |              |                  |                  |
|--------------|------------------|------------------|
| i) Semigroup | ii) Monoid       | iii) Group       |
| iv) Subgroup | v) Abelian group | vi) Cyclic group |

**OR**

**P. T. O.**

Q.4 Calculate minimum Hamming Distance for following codes and rewrite the code (10) using Even parity check- bits.  
C= {1001, 1101, 0010, 1110 }. Also explain Group codes with example.

Q.5 Explain Combinatorics and Basic counting principle. Also explain sum-rule and product rule with suitable examples. (10)

OR

Q.5 Write a note on Recurrence relation along with suitable example. Also explain linear (10) Recurrence relation with constant coefficient.

Q.6 Explain following concept with respect to graph theory with the help of suitable (10) examples:

- |                              |                      |                       |
|------------------------------|----------------------|-----------------------|
| i) Incident                  | ii) Adjacent         | iii) Degree of Vertex |
| iv) In-degree and out degree | v) loop              | vi) Parallel Edge     |
| vii) Isolated vertex         | viii) Pendent vertex |                       |

OR

Q.6 Explain Euler's path and circuit and Hamiltonian path and circuit with suitable (10) examples.

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