



ABV- Indian Institute of Information Technology & Management, Gwalior

Discrete Structures (IT201)

Mid-Semester Examination (Session 2023–24)

Maximum Time: 1.5 Hours

Max Marks: 30

All questions are compulsory. Answer each part clearly.

1. (a) Write the contrapositive and converse of the following statement: “If it rains, then the ground becomes wet.” (b) Show using truth tables whether $(p \vee q) \rightarrow r$ is equivalent to $(p \rightarrow r) \wedge (q \rightarrow r)$. [6]
2. (a) Define subset, proper subset, and power set with examples. (b) If $A = \{1, 2, 3, 4\}$, $B = \{2, 4, 6, 8\}$, find: $A \cup B$, $A \cap B$, $A - B$, $A \times B$. [6]
3. (a) Define injective, surjective, and bijective functions with suitable examples. (b) Let $f : Z \rightarrow Z$ be defined as $f(x) = 3x + 2$. Is f one-to-one? Is it onto? Justify your answer. [6]
4. (a) Draw all possible simple graphs with 3 vertices. (b) Determine the degree of each vertex in the graph with vertices $\{a, b, c, d\}$ and edges $\{ab, ac, bd, cd\}$. State whether this graph is connected. [6]
5. (a) How many 5-digit numbers can be formed using the digits 1, 2, 3, 4, 5, 6 without repetition? (b) In how many ways can 6 students be seated in a row of 6 chairs if two particular students must sit together? [6]