VIT
Vellore Institute of Technology

Fall Semester – 2023~2024
Continuous Assessment Test – I
Programme Name & Branch : B.Tech

Course Code & Name :BMAT205L – Discrete Mathematics and Graph Theory
Exam Duration : 90 Minutes

Slot : A1+TA1+TAA1
Maximum Marks : 50

Answer ALL the Questions

Each question carries equal marks (5 × 10 = 50 Marks)

1. Obtain the principal disjunctive and conjunctive normal forms of the statement $(p \rightarrow (q \wedge r)) \wedge (\neg p \rightarrow (\neg q \wedge \neg r))$ **[10 M]**

2. Derive $p \rightarrow (q \rightarrow s)$ using the CP-rule from the premises $p \rightarrow (q \rightarrow r)$ and $q \rightarrow (r \rightarrow s)$ **[10 M]**

3. Show that $\forall(x)\ (p(x) \vee q(x)) \implies (x)p(x) \vee (\exists x)\ q(x)$ by indirect method of proof. **[10 M]**

4. Show that a non-empty subset S of G is a subgroup of $(G, *)$ iff for any pair of elements $a, b \in S$, $a * b^{-1} \in S$ **[10 M]**

5. Consider the group $(\mathbb{Z}_6, \oplus_6)$. (i) Construct the Cayley's table (ii) Find the order of each element (iii) Find the inverse of each element (iv) Write all possible non-trivial subgroups (v) Obtain the left cosets of $H = \{0, 2, 4\}$ in $\mathbb{Z}_6$. **[10 M]**

****