SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)
(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.
B.Sc.CSc.(CGS) - END SEMESTER EXAMINATIONS - APRIL 2025
SEMESTER - I
21UCGAT1001 - Discrete Mathematics

Total Duration : 2 Hrs.30 Mins. Total Marks : 60

Section B

Answer any **SIX** questions $(6 \times 5 = 30$ Marks)

1. Construct the truth tables for the connectives Conjunction, Disjunction, Negation and Biconditional.
2. Show that the function $f : R \to R$ given by $f(x) = \sin x$ is neither 1-1 nor onto.
3. Prove given group (G,*) is abelian iff $(a * b)^2 = a^2 * b^2$ for all $a, b \in G$.
4. Prove that the number of vertices of odd degree in a graph is always even.
5. Prove that K_5 is non-planar.
6. Construct the truth table for $(p \to q) \wedge (q \to p)$.
7. Let $f : A \to B$ be a bijection. Then prove that f^{-1}: $B \to A$ is also a bijection.
8. Prove that the intersection of two subgroups of a group is also a subgroup.

Section C

Answer any **THREE** questions $(3 \times 10 = 30$ Marks)

9. Construct the truth table of
   (i) $P \vee (\neg P \to (Q \vee (\neg Q \to R)))$ (ii) $(\neg P \to R) \wedge (Q \leftrightarrow P)$.
10. Out of 100 students in a college, 39 play Tennis, 58 play Cricket and 32 play Hockey, 10 play Cricket and Hockey, 11 play Hockey and Tennis, 13 play Tennis and Cricket.
    (i) all the three games
    (ii) just one game
    (iii) Tennis and Cricket but not Hockey.
11. The necessary and sufficient condition that a non-empty subset H of a group G be a Subgroup in a $a \in H$, $b \in H \Rightarrow ab^{-1} \in H$ prove this.
12. Prove that a undirected graph G is Eulerian if and only if it is connected and has either zero or two vertices of odd degree. Also prove that if no vertex has an odd degree then the graph has a Eulerian circuit.
13. If G is a tree with n vertices then G has $(n-1)$ edges.

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