CSL105 : Discrete Mathematics

Minor Examination

Indian Institute of Technology Ropar

Instructor: Dr. Sudarshan Iyengar

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Total Duration : 2 hours | Total Marks : 80 M

Section I [5 Marks each]

1. Give an example of a relation which is [reflexive and symmetric] but not [transitive and antisymmetric].
2. Write the Hasse diagram of the relation $R = \{(a, b)/a|b\}$ where $S = 1, 2, \ldots, 10$.
3. State Pigeon hole principle and its extended/generalized version.
4. What is the condition for a function to be invertible? Explain with an example.
5. Show that in a group of 5 people, we cannot always guarantee of a presence of three mutual friends or three mutual non-friends.
6. A box contains 6 red, 8 green, 10 blue, 12 yellow and 15 white balls. What is the minimum no. of balls we have to choose randomly from the box to ensure that we get 9 balls of same color?
7. Which of the following statements is/are TRUE for undirected graphs? P: Number of odd degree vertices is even. Q: Sum of degrees of all vertices is even.
8. Let G = (V, E) be a loop free undirected graph. Prove that if G contains no cycle of odd length than G is bipartite.

Section II [10 Marks each]

1. Show that among any n + 1 positive integers not exceeding 2n there must be an integer that divides one of the other integers.
2. Prove that $n^2 - 1$ is divisible by 8 whenever n is odd positive integer.
3. Provide a story proof that $\frac{(n!)}{(3!)^k}$ is an integer, given that $n = 3k$. Generalize this result.
4. Enumerate all possible non-isomorphic graphs on 4 vertices.