Graph Theory Final Examination 2024, 12, 25

1. Find R(3, 4) and R(4, 4). (5 points)

2. Let G be a (p, q)-pseudograph which has a 2-cell embedding on S_n. Prove that $p - q + f = 2 - 2n$ where f is the number of faces in the embedding. (5 points)

3. Let G be a connected graph which is neither a complete graph nor an odd cycle. Prove that the chromatic number of G, $\chi(G) < \Delta(G) + 1$. (5 points)

4. Prove that in an n-connected graph G, any n distinct vertices are contained in a cycle of G for n > 2. (5 points)

5. Prove that in a bipartite graph G defined on (X, Y), G has a matching saturated X if and only if $|N(S)| \geq |S|$ for all $S \subseteq X$. (5 points)

6. Prove that Petersen graph can't be decomposed into three 1-factors and Petersen graph does not contain a Hamilton cycle. (5 points)

7. Find $z(91, 91; 2, 2)$, that is the maximum number of edges of a subgraph of $K_{91, 91}$ which does not contain $K_{2, 2}$. (5 points).

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