MATH 4341 – Combinatorial Design Theory Assignment #6 Winter 2013

Instructions

- Answer each question completely; justify your answers.
- This assignment is due at 15:00 on Friday March 1st in Assignment Box #48.

1. Prove that an affine plane $AG(2, n)$ with $n > 2$ is not a 3-design.

2. Find an affine plane $AG(2, 4)$.

3. Let G be a δ-regular bipartite graph.

   (a) Prove that G has a 1-factor.

   (b) Prove that G has a 1-factorisation.

4. An idempotent Latin square A is a Latin square for which $a_{ii} = i$. A symmetric Latin square A is a Latin square for which $a_{ij} = a_{ji}$.

   (a) Find a symmetric idempotent Latin square of side 4 or else show that none exist.

   (b) Find a symmetric idempotent Latin square of side 5 or else show that none exist.

   (c) Prove that there exists a one to one correspondence between symmetric idempotent Latin squares of side $2n - 1$ and one-factorisations of K_{2n}.