

93学年度才2学期博班資格考

博班資格考 - 設計理論

Design theory

(Choose 5 from the following 6 problems 20% each)

1. Let A be a $(0, 1)$ m by n matrix. I_n and J_n be the identity matrix and all one matrix respectively. Prove or disprove that if $m \leq n$ and $A^T \cdot A = \alpha I_n + \beta J_n$ then $A \cdot A^T = \alpha I_m + \beta J_m$.
2. State and prove Singer's Theorem and use this theorem to construct a 2 - (21, 5, 1) design.
3. Prove or disprove the uniqueness of the projective plane of order 3.
4. Construct a (11, 5, 2) difference set and use this difference set to generate a 3 - (12, 6, 2) design.
5. Prove or disprove that you can find at least two non-isomorphic 2 - (16, 6, 2) design.
6. Construct two idempotent orthogonal Latin squares of order 4 and derive a general rule to construct idempotent orthogonal Latin squares of order $q > 3$ where q is a prime power.