

Instructions

- Answer each question completely; justify your answers.
 - This assignment is due at 17:00 on Thursday January 22nd in Assignment Box #37.
1. Construct a $(13, 3, 1)$ -design.
 2. Prove that every $(6, 3, 2)$ -BIBD is simple.
 3. Prove that no BIBD with $v = 8$, $k = 3$ and $\lambda = 1$ can exist.
 4. The necessary conditions for the existence of a $(v, 3, 1)$ -BIBD are that $v \equiv 1$ or $3 \pmod{6}$.
What are the necessary conditions for the existence of a $(v, 4, 1)$ -BIBD?
 5. Suppose that (X, \mathcal{A}) is a (v, b, r, k, λ) -BIBD and let (Y, \mathcal{B}) be the dual design of (X, \mathcal{A}) . Prove that the following are true:
 - (a) every block in \mathcal{B} has size r
 - (b) every point in Y occurs in exactly k blocks of \mathcal{B}
 - (c) any two distinct blocks $B_i, B_j \in \mathcal{B}$ intersect in exactly λ points
 6. Exercise 1.11.