

Homework Assignment of Combinatorial Design (III)

Due Jan. 12th 2021

1. Prove that $K_{m(n)}$ can be decomposed into K_3 's if and only if $m \neq 2$ and $K_{m(n)}$ is 3-sufficient.
2. Prove that for each $n \neq 1, 2$ and 6 , there exist two orthogonal Latin squares of order n .
3. Prove that K_v can be decomposed into K_4 's if and only if $v \equiv 1$ or $4 \pmod{12}$.
4. Find an n such that $n \equiv 2 \pmod{4}$ and there exist 100 MOLS(n)'s.
5. Prove that a Steiner quadruple system of order v , SQS(v), exists if and only if v is congruent to 2 or 4 modulo 6.
6. Find two applications of combinatorial designs. (Explain more details.)
7. (Bonus) Prove or disprove that the set of triples of a STS(v) can be partitioned into v partial parallel classes.

(*) 6 points for each problem