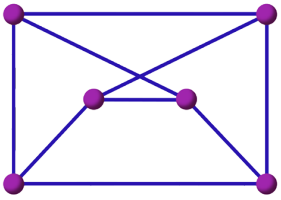

SEMINARIUM
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Covering complete graphs with small cliques

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Covering a complete graph by copies of a clique is a well studied problem in design theory. For $v \geqslant k \geqslant 2$, a 2-$(v, k, 1)$ covering is a pair $(X, \mathcal{B})$, where X is a v-set, and $\mathcal{B}$ a collection of k-subsets called blocks of X, such that every pair in X is contained in at least 1 block in $\mathcal{B}$. An optimal 2-$(v, k, 1)$ covering clearly minimises $|\mathcal{B}|$ and meanwhile minimises the number of pairs covered more than once. We consider a cover of the complete graph by cliques of different orders $k_i \in K$, modelled by a 2-$(v, K, 1)$ covering, in which case we call a cover optimal, if it minimises the number of blocks among those designs that minimises the number of pairs covered more than once. We show the complete result on optimal 2-$(v, \{3, 4\}, 1)$ coverings, and bring up the problem of finding optimal 2-$(v, \{3, 4, 5\}, 1)$ coverings.