

# EXISTENCE AND EMBEDDINGS OF RESOLVABLE GROUP DIVISIBLE DESIGNS

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**Abstract:** For given positive integers  $v$ ,  $k$  and  $m$ , a group divisible design, denoted  $GD(k, m; v)$ , is a triple  $(X, G, A)$  where  $X$  is a  $v$ -set,  $G$  is a set of  $m$ -subsets of  $X$  (called groups),  $G$  forms a partition of  $X$ , and  $A$  is a set of  $k$ -subsets (called blocks) such that each block intersects each group in at most one point, and each pair of distinct points from distinct groups is contained in a unique block. A  $GD(k, m; v)$  is called resolvable and denoted  $RGD(k, m; v)$  if the blocks can be partitioned into parallel classes. Now let  $(X, G, A)$  be an  $RGD(k, m; v)$  and  $(Y, H, B)$  be an  $RGD(k, m; u)$ , if  $X$  is a subset of  $Y$ ,  $A$  is a subset of  $B$ , and each parallel class of  $A$  is a part of some parallel class of  $B$ , then  $(X, G, A)$  is called a subdesign of  $(Y, H, B)$ . In this talk, we will survey the progresses on the existence of resolvable group divisible designs. We will also survey the progresses in the study of the embedding problem for resolvable group divisible designs. We will determine necessary and sufficient conditions for the embeddings of resolvable group divisible designs with block size three and any group size. Embeddings for related structures are also discussed.