Q.1 A $2-(n^2, n, 1)$ design is called an <u>affine plane</u>. Let D be a projective plane of order n, ie a $2-(n^2+n+1, n+1, 1)$ design. If we delete one block and all the points of that block, so that the remaining blocks give an affine plane of order n.

Q.2 Conversely, given an affine plane D of order n, construct a projective plane $\mathbb{P}_D$ of order n such that D is obtained from

$\mathbb{P}_D$ by the process given in Q.1.

Q.3 Prove any $2-(6,3,2)$ design is simple. ie it has no repeated blocks.

Q4. Consider a Steiner system $S(t,k,v)$ (ie $\lambda=1$) with $t<k<v$. Prove that it can not be a $t+1$-design.

Q.5. Let G be a regular graph of deg. k on n vertices such that any two vertices have a unique common neighbour.

Define an incidence structure with points being vertices of G and blocks as $\Gamma(x)$ (neighbours of x) for every $x \in G$. Prove that this gives a projective plane of order $k-1$.