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13. Combinatorics

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Partial geometries and the Krein condition

If $\mathcal{S}$ is a geomerty of points and lines, such that every line has $s+1$ points, every point is on $t+1$ lines (with $s > 0$, $t > 0$) and for any antiflag (a, l) there is exactly α points on l, which collinear with a, then $\mathcal{S}$ is called a α-partial geometry of order (s, t), or $pG_\alpha(s, t)$. A point graph of partial geometry $pG_\alpha(s, t)$ is strongly regular with parameters $v = (s+1)(1+st/\alpha)$, $k = s(t+1)$, $\lambda = (s-1) + (\alpha-1)t$, $\mu = \alpha(t+1)$. A strongly regular graph Γ with this parameters is called pseudogeometric graph for this geometry.

It was proved in [1] that a strongly regular locally $GQ(4, 8)$ graph Γ has parameters (870,165,36,30) or (486,165,36,66). In last case Γ is pseudogeometric graph for partial geometry $pG_2(5, 32)$. This graph has equality in the Krein condition:

$(s+1-2\alpha)t \leq (s-1)(s+1-\alpha)^2$.

Theorem. *A pseudogeometric graph for partial geometry $pG_2(5, 32)$ does not exist.*

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Reference: [1] A. A. Makhnev. On strongly regular extensions of generalized quadrangles, Matem. Sbornik 1993, v. 184, 123–132.