

Math 821 – Combinatorics
Homework Assignment #5
23/3/2007

To be handed by 30/3/2007

The questions are sorted roughly according to their difficulty, the number of marks for them will correspond to this.

Question 1:

1. Find a vertex-transitive regular graph that is not strongly regular.
2. Find a regular graph that is not distance regular.

Question 2: Consider an association scheme on a set X of size 6.

1. Prove that at most one of the classes R_i ($i > 0$) can have valency (that is p_{ii}^0) equal to 1.
2. Write down four distinct association schemes on X .
3. Prove that there are exactly four different association schemes on X , in the sense that any others are obtained from one of these four by relabelling.

Question 3: Let A be a symmetric matrix with zero diagonal whose entries are 0 and 1. Suppose that there are integers x , y and z such that $A^2 = xI + yA + zJ$. Show that A , I and $J - A - I$ are the adjacency matrices of an association scheme and find its parameters.