Universität des Saarlandes
FR 6.2 Informatik

Prof. Dr. Benjamin Doerr, Dr. Danny Hermelin, Dr. Reto Spöhel **Summer 2011**

Graph Theory: Test 12 (Monday, July 4, 2011)

Time: 20 Minutes

Name: _____

Exercise 1+2 (*total 8 points*)

Answer each of the following questions. If proofs are needed, a short sketch of the main argument is sufficient. If counterexamples are needed, it suffices to give the example (unless it is not obvious why this is a counterexample). All questions can be answered in about two lines. Each item is worth one point.

a) State Ramsey's Theorem.

b) Give the Ramsey number of 3.

c) What would you need to show in order to prove that the Ramsey number of 6 is at least 120? Give you answer in the *coloring terminology* (as opposed to the clique/independent set terminology).

d) What would you need to show in order to prove that the Ramsey number of 6 is at most 150? Give you answer in the *clique/independent set terminology* (as opposed to the coloring terminology).

e) Explain in 1-2 sentences how we inferred a deterministic statement from a probabilistic one (via the so-called *probabilistic method*) when we proved lower bounds for Ramsey numbers.

f) In the proof of upper upper bounds for Ramsey numbers given in the sample solutions for Assignment 9, we derived a simple recursive inequality for the asymmetric Ramsey numbers $R(k,\ell)$. State that recursive inequality.

g) How many different graphs are there on the vertex set $V := \{a,b,c,d\}$? (Two graphs $G = (V,E)$ and $G' = (V,E')$ are different if and only if $E \neq E'$. Two different graphs may still be isomorphic to each other.)

h) What is the probability that a random graph G_n (a graph drawn uniformly at random from all graphs on vertex set $V_n = \{0,\ldots,n-1\}$) contains no edge?

Feedback:

How many hours did you spend working on the last assignment sheet?

The material covered last week was [ ] easy, [ ] fine, [ ] difficult, [ ] very difficult.

Comments?