

# Exam material

V5D4 - Selected Topics in Geometry - Summer semester 2017

**Generalities.** The exam will be a written exam and you will be allowed only your writing materials. You will be expected to know the concepts and results listed below, together with their proofs (unless otherwise specified) and to be able to solve exercises similar to those that were made available during the semester.

**Concepts you need to know.**

- *Probability theory:* total variational distance of probability measures, The Chen-Stein Method for Poisson approximation
- *Graph theory:* the configuration model for random regular graphs, automorphisms of graphs, cycles in graphs, expander graphs, the permutation model for random regular graphs,
- *Surfaces:* Hyperbolic plane, hyperbolic surface, (closed) geodesics, right-angled hexagons, pair of pants, pants decompositions and their dual graphs, Bers constant, minimal total pants length, random hyperbolic surfaces using the Weil-Petersson metric, random surfaces using the configuration model, triangulations and their dual graphs, Euler characteristic of a surface.

**Results you need to know.** Lemma 1.5, Theorem 1.8, Proposition 1.10 (without proof), Theorem 2.1, Lemma 3.5, Theorem 3.7 (without proof, you should however be able to compute  $\lim_{n \rightarrow \infty} \mathbb{E}[X_{n,k,r}]$ ), Corollary 3.8, Theorem 4.1 (without proof), Theorem 4.2, Lemma 4.6, Theorem 5.1, Lemma 6.1, Lemma 6.2, Lemma 6.3, Theorem 6.4, Proposition 7.4 (without proof), Proposition 7.5, Proposition 7.6, Proposition 7.7, Theorem 7.9, Proposition 8.1, Proposition 8.3, Proposition 8.6, Proposition 9.3, Theorem 9.4, Theorem 9.7, Theorem 9.10, Lemma 10.2, Lemma 10.4, Lemma 10.5, Theorem 10.6, Corollary 10.7.

You will be expected to know how to prove the result as well, unless

- It says ‘without proof’ above,
- or the proof was not given or only sketched (in this case it says proof sketch in the notes) during the course.