Information on the written exam

February 14, 2022

Administrative information (hopefully definitive dates).

- Last day to register to the exam: 25 February 2022 (Chalmers) and 07 March 2022 (GU).
- Written exam: 14 March 2021 (8:30-12:30). I'll try to come at ca. 9:45.
- Last day to register to the re-exam: 19 May 2022 (Chalmers) and 19 May 2022 (GU).
- Re-exam: 9 June 2022 (14:00-18:00).
- Grades: U, 3, 4 or 5 (Chalmers) and U, G, VG (GU).
- Limits from previous years: 3:15-21p, 4:22-28p, 5:29p- (Chalmers) and G:15-26p, VG:27p- (GU)
- The awarded bonus points will be added during the grading process if needed. In order for me not to forget such points, please indicate in your exam if you think you should have bonus points.
- Contact me before the 27th of February via email (with a valid document from FUNKA) if you need more time for the exam.
- The results of your exams will be reported to you as soon as possible. Please consider that I will probably have to correct more than fifty exams. It is thus not necessary to send me an email asking for your grades.

Expectations.

- Students are expected to know and be able to apply the main definitions and results (statements and possibly some ideas of the proofs) from the lecture in order to solve various tasks.
- Students should explain, analyse, evaluate, and demonstrate their mastery of the course content.
- The exam may contain multiple choice questions, true and false questions, or open-ended questions.
- The exam may contain industrial tasks (pure and easy computations) and questions assessing students critical thinking skills.
- Please explain all steps in your computations and write the mathematics properly (do not just display randomly equations and hope that I find the correct one).
- Please use a proper pen, check that your exam is readable and if possible that your answers are ordered correctly.

- The exam is written in English. You can write your answers in English, French, German or Swedish.
- Being able to do previous exams do not imply success in this year's exam.
- No questions will be answered by the examinator 6 days before the exam.
- In case of online exams, no detailed proofs will, most probably, be asked.
- In case of online exams, you may be asked to check a box with a text like this: " I assure that I did this exam on my own without getting help from any other person and that I formulated all the solutions myself. "
- In case of online exams, please: write your cid or first numbers of your personnummer, use a proper pen, order your answers, use an app like camscanner or equivalent, and check your final scan before uploading it. Check also the uploaded version.

Important concepts and results from the lecture.

The list below includes relevant concepts and results from the lecture and is provided as an indication or checklist (not as a statement):

- Basic facts of Hilbert spaces.
- Applications of Lax–Milgram theorem.
- Variational formulation, minimization problem, cG FEM, linear system for BVP in $1d$ with Dirichlet or Neumann BC.
- A priori and a posteriori error estimates for the model BVP.
- Approximation properties of polynomials and piecewise linear functions.
- Applications of classical and composite quadrature formulas.
- Applications of basic numerical methods for IVP.
- Applications of finite difference (if we have time for this).
- Stability results for PDEs (heat and wave).
- Variational formulation and FEM for PDEs in $1d$.
- Derivation of FEM for problems in $2d$.
- Error estimates for FEM applied to Poisson's equations and the heat equation in $2d$.

Feel free to post your self-designed exam questions on the piazza page of the course (using the label exam).

Questions or comments on this document or related to the exam should be posted on the piazza page of the course!