

Information on the written exam

December 7, 2020

Administrative information.

- Last day to register to the exam: 17 December 2020
- Online written exam, 16 January 2021
- Last day to register to the re-exam: 21 March 2021
- Re-exam: 07 April 2021.
- Grades: U, 3, 4 or 5.
- A table of Laplace transforms will be provided.
- The awarded bonus points will be added during the grading process. In order for me not to forget such points, please indicate in your exam if you think you should have one or two bonus points.
- If not already done, contact me before the 17th of December 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 have to correct more than hundred of exams in addition to preparing a new course. 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.
- Since the exam will take place online, no detailed proofs will, most probably, be asked.
- Please explain all steps in your computations and write the mathematics properly (do not just display randomly equations and hope for someone to find the correct one).
- Please use a proper pen and check that your final scan is readable and if possible that your answers are ordered correctly.

- You may be asked to check a box with a text like this: ” Jag försäkrar att jag gjort tentan på egen hand utan att få hjälp från någon annan person och att jag själv formulerat alla lösningar. ”

Important concepts and results from the lecture. The list below includes relevant concepts and results from the lecture (this does not mean that the other ones may not be used):

- Span. Inner product. Functional spaces. Cauchy–Schwarz inequality.
- Lagrange polynomials. Hat functions. Orthogonal projection.
- Interpolation errors. Quadrature formulas.
- FEM (Differential equations. Variational forms. FE problems. Linear systems of (differential) equations. Pseudo-code).
- Explicit Euler and backward Euler schemes. Crank–Nicolson schemes.
- Heat equation and wave equation in $1d$.
- Definition and properties of Laplace transforms. Derivation of the Laplace transforms of $\sin(at)$ and $\cos(at)$. Applications of the Laplace transforms.
- Derivation of the formulas of the Fourier coefficients. Computation of Fourier coefficients. Bessel’s inequality. Parseval identity. Properties of Fourier series.
- Superposition principle. Separation of variables.

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 should be posted on the [piazza](#) page of the course!