Open book examination in TBMT02 Medical Images

The exam is available for download not earlier than 18.00 o’clock the 10th of March from the course web page (‘course documents’) in Lisam or course web page at IMT.
Return no later than 18.00 o’clock the 17th of March by submission via Lisam.

The exam consists of three (3) cases. They are similar to those you have practiced at the tutorial sessions. Sometimes they are a little bit more specific. Remember to use the experience and workflow from the tutorial session when you are solving these three tasks.

You are allowed to use all material you collected throughout the course.
If you are discussing or brainstorming together with another student, write down his/hers personnel identification on the home exam. It is allowed to do the brainstorming in a tutorial group but thereafter should all learning goals and analysis be made individually.

Reports are written individually.

Plagiarism is presenting someone else’s ideas or words as your own.
Do not copy; instead use the sampled information to create your own knowledge.
If you are to make quotations, do not forget to put it within brackets and only short quotations. Paraphrasing without giving credit, or changing only a few words (i.e. paraphrasing too closely) even if you give credit are also examples of plagiarism. All ideas and facts that are obtained from other sources must be properly cited, unless they qualify as common knowledge. (If in doubt about whether something is common knowledge, provide a citation.) All exams will be automatically submitted to Urkund from Lisam to check for plagiarism.

The submission is blind, that is the examiner cannot see which student the exam belongs to until the grade has been set. (Please make sure all meta-information is removed in the document submitted.)

The exam consists of 3 cases. To every case you are expected to formulate 3 questions. If the questions are relevant to the case and the learning outcomes of the course you will gain 1 p.
The three questions should be answered as good as possible and will be evaluated according to the SOLO taxonomy consisting of 5 levels. (See http://www.learningandteaching.info/learning/solo.htm for examples.) The lowest level will give 0 p and levels 2-5 will generate increasing number of points. For every case you will get a maximum of 10 p. A minimum of 4 p for each case is required in order to pass the exam.

Grading:  

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<thead>
<tr>
<th>Score</th>
<th>UK</th>
<th>Grade</th>
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<tr>
<td>&lt;12</td>
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<td>F (not passed)</td>
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<tr>
<td>12-17</td>
<td>3</td>
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<td>&gt;23</td>
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Results are available 14 working days after the exam.

Good luck!!!
Göran Salerud
28 67 55
For each of the situations below identify different aspects of the problems and define 3-4 different questions in accordance to both the description of the situation and the aims of the course (learning outcomes). It is welcomed that these questions are answered including a background, analysis, applicability and a validation. You will be assessed both on basis of the delivered answers but also on basis of the questions chosen. Do not forget to motivate your answers if necessary. Maximum number of pages for the exam is limited to 15.

1) During the last 5-10 years the use of computerized tomography has increased a lot. A couple of years ago the number of CT (computed tomography) examinations was about 20% of the total number of X-ray examinations, while the CT examinations induced 60% of the total radiation dose to people. Therefore, before buying a new modern CT (multi-slice-spiral-CT) you are invited by the politicians at the County Council to tell them how the CT technique has been developed in order to avoid a further increase, or even better, to lower the collective dose to the people. The new equipment should also be used in mammography screening to detect very small malignancies and the listeners were asking if the new CT would have less good image quality compared to the older methods with lower total radiation doses. Since politicians are not radiologists, you even have to explain how the radiation doses for different examinations are measured and one of the journalists is suspicious and wonder if the radiation from modern CT is unnecessary and dangerous. Other listeners asked you to tell them more basically how the CT works and how to ensure that the children get as low dose as possible and also if there are alternatives regarding examination technique.

Motivate how and what you are going to include in your presentation and give some background to your choices e.g. physical principles.

2) It has been very popular to measure the content of fat in the body and especially visceral fat by means of MRI. The radiographers at the MR ward are very disappointed about the image quality in the MR images. The pulse sequence for fat suppression is not working. Furthermore “ghosts” appeared frequently in the chest images. Now you have to try to explain for the radiographers how fat and water can be used to make MRI successful in visualizing and quantifying different constituents of the body. They have more questions unsolved and kindly ask you to explain to them something about phase- and frequency encoding and if they could change these directions and minimize the artefacts and improve image quality. Therefore, you also have to explain the most common artefacts and how to avoid them, and if the use of a 3 T MRI camera instead of the old 1.5 T MRI would have made a difference.
3) Finally, after graduation from the master program in Biomedical Engineering at Linköping University you are appointed your first employment at The University Hospital MAS in Malmö. The hospital and especially the department of clinical physiology, has a strong focus on ultrasound imaging. One of their new research projects is development of a specially designed and small ultrasonic probe, which can be guided through the oesophagus for a good position and insonation of the heart. The probe will be used to monitor the heart valves and chambers from the inside of the oesophagus. This is a new technique for the staff at the department and many questions arise the first days. How are the probes fabricated? Is it a single or multiple element probe or made up of a large array? Depending on the technique used how does it actually works and what about image quality? Will there be problems when you do not see the attached surface and has it the possibility to give similar data as regular extra-corporal probes. Before starting the project, it has to be established among the clinicians and you, the ultrasound expert and responsible for the ultrasound equipment at the hospital, are asked to arrange a seminar/lecture next Monday regarding the new equipment and the investigations that can be made. To be prepared, you ask the staff to send you questions through email. Next morning your mailbox is filled with questions about the measurement method, risks, image distortion, errors in general, real-time etc. You realize that your weekend is already fully booked and you even have to discard your weekly cinema visit. But you need to be prepared for Monday and you immediately start to ask yourself relevant questions and find the answers forming and preparing the lecture. Monday will not wait? How should you do it?