This exam will be 50 minutes long and is out of 50 marks.

This exam has 4 pages (including this cover page). There are 2 questions, both of which have multiple parts.

Please answer all questions in the space provided on this exam; if you find it necessary to continue an answer on the back of a sheet of paper, that is fine, but please make a note on the front side, e.g., “answer cont’d on back”.

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<th>Question</th>
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<td>1.</td>
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<td>2. a)</td>
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1. (20 marks) Sketch the UML diagrams corresponding to the following situations:

a) (8 marks) Each patient with cancer is assigned for treatment to one cancer clinic, and is under the care of one supervising physician and two or three consulting physicians. Each physician can be associated with up to three cancer clinics, and can be either a consulting or supervising physician for any number of patients.

b) (12 marks) Every medical school has an associated set of registered medical students. Each medical student has an associated name and ID #, and can be either a 1st year student, a 2nd year student, or an intern. As students progress through their studies in groups, each student is associated with a class, which in turn has an associated expected year of graduation for the members of that class, e.g., MUN Medical School Class of 2012. Each 2nd year student has an integer rank that they achieved in their 1st year studies, and each intern has both an integer rank that they achieved in their 2nd year studies and a supervising doctor. Each intern is supervised by one doctor, and a doctor can supervise between 2 and 7 interns.
2. (30 marks)

All parts of this questions refer to the clinic-example handout.

a) (16 marks) Given classes Schedule, Appointment, Treatment, TreatmentRad, TreatmentChm, ClinicPersonnel, CliPerNurse, CliPerSpec, CliPerSpecOnc, and CliPerSpecRad derived from the description in the handout, give a UML diagram showing all of the relationships between these classes implicit in this description. Do not include class fields in this diagram.

b) (14 marks) Specify the syntax portion of a MIS for the schedule module described in the handout by filling in the table on the following page. You may assume the existence of classes ClinicPersonnel and Appointment and exception-types InvalidCIN, InvalidDate, InvalidDateRange, InvalidRoom, InvalidApptDate, InvalidApptRoom, and InvalidReference.
<table>
<thead>
<tr>
<th>Name</th>
<th>Inputs</th>
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