ELEC-E8408 Embedded Systems Development

EXAM 19.9.2016

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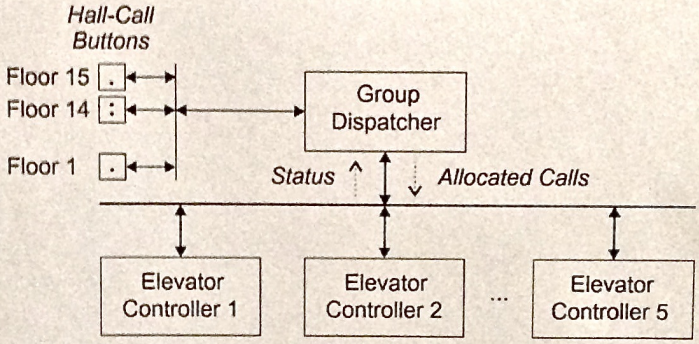
1. Are the following claims true (T) or false (F)? Every correct answer gives you +1 p, every incorrect –1 p, and an empty answer is worth 0 p. The minimum amount of total points is 0 p and maximum 6 p.

   a) Consistency checking is a typical use for formal methods in requirements engineering.
   b) FSM descriptions form a convenient basis for automatic code generation.
   c) Software partitioning into multiple software units with high external coupling and low internal cohesion leads to a high level of maintainability.
   d) The productivity of programmers is potentially improved through the use of object-oriented techniques.
   e) The SLOC metric takes into account the overall complexity of the software involved.
   f) The basic COCOMO is intended for making accurate estimations of project costs and resources.

2. Below is an architectural block diagram of an elevator control system. The Group Dispatcher has a serial interface for registering and canceling hall calls, and it allocates registered calls dynamically to the most suitable elevators depending on their current status. Thus, the group dispatcher needs to periodically collect status information from each individual Elevator Controller. In this case, the elevator bank has five elevators and they are serving 15 floors.

   Identify three areas, which are particularly susceptible to critical faults. (3 p) And modify the block diagram in such a way that the modified version has built-in *fault-tolerance* against those faults. (3 p)

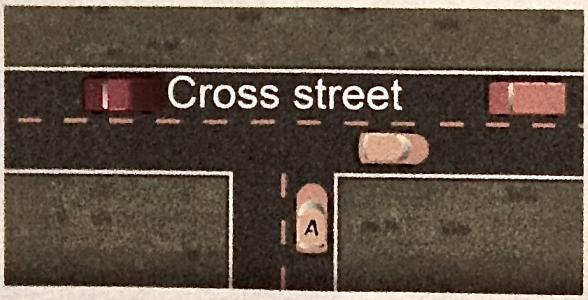


3. Explain the principles of *black-box* and *white-box* testing (3 p), and compare their advantages and disadvantages in software module testing (3 p).

4. Draw a Moore-type FSM that describes a *safe* control logic for traffic lights in the intersection shown below. (3 p)

   - The streets are meant for two-way vehicle traffic.
   - On the Cross street, there are separate traffic lights for straight-going and turning traffic flows.
   - The traffic lights are controlled by timers.
   - There are no crosswalks for pedestrians.

   Define the purpose of all states and the events that control state transitions unambiguously. (3 p)



5. Describe the *values* (3 p) and main *principles* (3 p) of Agile Methodologies for software development.