January 2010 - a

SORTES: Software for embedded and real-time systems

1) You are asked to write a C function that receives the value of a pointer to a structure including a variable of type `enum role { PROF, ASSIST, STD };`, a pointer to a union of type `pers_data` and a pointer to an int called `status`. Your function must call one of the functions the addresses of which are stored in an external table `handle[]` in the same order as the elements of the enumeration. All these functions have as single argument the value of a pointer to a `pers_data` and return an int, `result_code` that your function must store in `status`.
2) Represent in ASG the behaviour of a railway crossing: there is a road with lights and barriers and two pairs of rails. Trains can come from the 2 directions. There are train detectors for each pair of rails at some distance before and after the crossing. Near each detector, there are also signals autorizing trains to enter and leave the track section with the crossing.
3) In the microchip tcp-ip stack, scheduling is performed by round robin schedulers. Explain the principle these schedulers and how to transform such a scheduler in a fixed priority scheduler. What are the constraints on your software for each of these schedulers to be suitable in a hard real-time system.
4) What kind of fault tolerance system would you recommend to take care of transient errors in a small control system and why.

duration: 3 hours, with open books and notes.