

UNC Charlotte–ECGR4161/5196-Midterm Exam 2 –4/1/2009

Name: _____ Mosaic User ID _____

Question	1	2	3	4	5	6	Total
Score	/10	/10	/15	/15	/25	/75	/150

You are permitted 75 minutes to take this test, no more. This is an open book/open notes test. You are allowed the following items for the test: calculator, books, notes, homework, labs, pencils and erasers. You are not permitted to have any of the following on your desk during the test: computer, cell phone, or other electronic assistance. Failure to abide by this policy will result in a zero for the test and a visit to the UNC Charlotte honor board. **Put your answers on paper provided, and turn in this sheet and the answer pages - use only that paper.**

Please read and sign this statement: I have not received from anyone nor assisted others while taking this test. I have also notified the test proctor of any of these violations noted above.

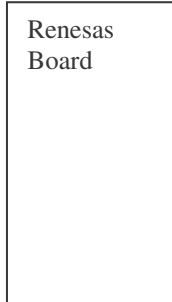
Signature: _____

1. Consider a robotic arm that is used in a bakery manufacturing line. Is this considered an autonomous robot? Why or why not? Write this in 2-3 sentences. (10 pts)



2. With respect to the robotic arm above, what are some of the design considerations of such a robot. (10 pts)

5. Starting with the box on the left hand side of the paper and the motor on the right hand side, draw the FULL schematic of a H-Bridge circuit that is controlled with enable and direction lines and drives one DC motor. Include power sources. I want to see all logic gates and power transistors. You do not need to identify specific part numbers, R values, and pins. (25 pts)



6. Consider you will design an autonomous robotic vehicle that can sense its environment and move to perform a task. The environment is underwater in a sea or lake with a minimum depth of 3 m and a maximum depth of 30 m. The underwater vehicle will be 1 meter in length and 0.15 m in diameter when stored (although the device can deploy fins or expand when activated). The vehicle will travel towards a pre-placed underwater beacon at specific frequency (the beacon source is on the ocean or lake floor). Once the vehicle is over the beacon, it will attach itself to the cable/chain holding a mine that is floating 1.5 m under the surface of the water. Once the vehicle is attached, it will wait for another beacon at another frequency. When it detects this new frequency, it will self destruct. It should be close to but not touching the mine.

Using blank paper, write the requirements for the robotic vehicle. The requirements should include the type of sensing and motion. Also identify performance measures for the entire system (beacon and vehicle). You need to write at least 15 requirements. Use your knowledge of requirements from senior design and the labs as guidelines. (75 points)