Car/Gondola Lab Report

Group: _____

The following list is a **MINIMUM** suggestion of material that would logically be included in the report. It is not intended as a direct guide. You have done the experiments, so you have the best idea of what you needed to complete those projects and what you learned during the process. This means that the following information may be incomplete based on your experience with the project. If you feel part of what you did during the laboratory is pertinent, include that information.

Introduction			
Abstract	_____	_____	
Purpose/Objectives	_____	_____	
Overview of controller	_____	_____	
_____	_____	_____	*Sum:* _____
Hardware Description			
Overview	_____	_____	
Speed controller	_____	_____	
Servo motor	_____	_____	
Compass	_____	_____	
Ranger	_____	_____	
LCD/keypad	_____	_____	
Accelerometer	_____	_____	
Serial Bus	_____	_____	
Pin connections from priority table	_____	_____	
_____	_____	_____	*Sum:* _____
Software Description			
Overview/Description	_____	_____	
Initialization - Ports, PCA, ADC, XBR0	_____	_____	
Use of the PCA	_____	_____	
Pulse Streams	_____	_____	
Setting the Crossbar	_____	_____	
I2C Read and Write	_____	_____	
Use of I2C (SMB)		_____	_____
Reading Analog Input, A/D Results	_____	_____	
Keypad input & LCD output	_____	_____	
Control loops	_____	_____	
Timing	_____	_____	*Sum:* _____
Results & Conclusions			
Analysis of results	_____	_____	
Description of gondola performance	_____	_____	
What was Learned	_____	_____	
Problems Encountered & Solution	_____	_____	*Sum:* _____
Code			
Indents, alignments, tight single-spaced, **`Courier`** font	_____	_____	
Commented	_____	_____	*Sum:* _____
Flowchart & Pseudocode			
Content	_____	_____	
Format	_____	_____	*Sum:* _____
Schematic			
Content (Chips, Devices, Buses, Slaves, Master, Passive components, etc.)	_____	_____	
Format	_____	_____	*Sum:* _____
Formatting & Neatness			
Consistent Page Numbering thru report	_____	_____	
Cover Sheet (section # & side, grading TA)	_____	_____	
Table of Contents	_____	_____	
Figure numbers/captions	_____	_____	
Tables numbers/captions	_____	_____	
References (Proper Format)	_____	_____	
Spelling & Grammar	_____	_____	
Division of Labor	**Y/N**	_____	*Sum:* _____
Lateness (unexcused)			
-20% per School Day	-20 x _____	_____	*Sum:* _____
Total	**100**	***Total Points:*** _____	

NOTE: No report grades will be given without electronic versions e-mailed to your LITEC grader for archival purposes!

LITEC Final Report Guidelines (revised, spring 2013)

The final lab report for LITEC covers Labs 3 through 6. This rubric (GradingCar-GondolaReport_C8051-student) on LMS, in the Laboratories & Worksheets section under Course Materials, lists most of the items to be included, but the list is not necessarily exhaustive. **It is important to note that much of the final report can be written before finishing Labs 5 and 6**. About half of the written portion (excluding the plots and code listings) deals with describing the components that were used to achieve your final results and how they work. This can greatly reduce the time crunch at the end of the semester.

After discussing all the components involved in driving and steering the car and gondola (drive motor, servomotor, PCA, CEXn outputs, I2C (SMB), compass, ranger, accelerometer, LCD display & keypad, ADC monitoring battery voltage, RF serial link, etc.) the report should include detailed descriptions of two final goals: 1) the feedback system on the car involving the accelerometer and driving the car to the top of the hill, and 2) the feedback systems on the gondola involving the compass and ranger in correcting heading and altitude errors. Both discussions should explain how the PWM pulse-width calculations are made based on the errors and feedback gains (proportional, derivative, and integral, if appropriate). With respect to response plots (described below), analyze the various plots and justify their shapes for the sets of gains used.

Reports must contain:

1) Wiring diagram† of the Lab 5 car (with LCD display & keypad, accelerometer, motor connections [2], and DAC input from battery)
2) Wiring diagram† of the gondola (with compass, ranger, LCD display & keypad, and motor connections [4]) – Note I2C devices and motors in gondolas are wired the same way as for cars
3) Flow chart† for ONLY the gondola (Lab 6) and pseudocode for Labs 5 & 6.
4) Program listings for the accelerometer (Lab 5), and gondola (Lab 6) programs
   Program listings must be well commented and formatted as follows:
   - Use a fixed spacing font - Courier (Note: this is only for the code listing, not the rest of the report)
   - Set the font size to 10 points, only left-justified
   - Make sure proper indenting is used consistently throughout
   - Use single line spacing with no (0) pts before or after each line
   - Include an appropriate prolog (programmer names, section & side, date, brief description, etc.)
   - Line comments and block comments should be used liberally
5) Clearly labeled and captioned plots for data acquired during lab, with scaled axes & units
   - Normalized drive motor pulse-width and pitch (front-to-back tilt) from accelerometer, both vs. time as the car drives up the incline.
   - Time plots from gondola showing heading angle as it corrects itself for several different values of P and D heading gains (Follow the cases given in the lab procedure)
   - If further investigations were made of the heading control with the addition of the vertically oriented side thrust fans to assist the tail fan in correcting heading errors, those response plots should also be included.
   - Desired heading and actual heading tracking vs. time when ranger distance value is used to input a desired heading value.
   - {Optional} Normalized thrust fan pulse-width (y-axis) vs. ranger distance (x-axis) for a set of height gains (Kp = 10, Kd = 30) as the ranger distance varies from the neutral position to a maximum or minimum distance, and back to the neutral. Do this with a slow and fast change in distance.

†Diagrams should be generated using appropriate drafting software. A free version of PSpice is available on campus for drawing circuits. Check LMS for a link to the download.