



Due 24 April 2008 at 6:00 pm

DC (Beakman Inspired) Motor

For this project, students can work in groups of two to four. A group of three or four must produce and test at least two distinctly different final motor designs. However, they need only write one report. Groups of two need only do one new motor design.

Grading

Preliminary Performance (from Pre-Project) (5 pts) _____

Final Motor Performance (15 pts) _____

Only one test is necessary for a group of 2 students. Two tests are required for larger groups. Additional tests can be done by any group that wishes to improve their performance.

Motor Speed _____	Witnessed _____	Date _____
Data Plot Printed and Signed _____		Date _____
Motor Speed _____	Witnessed _____	Date _____
Data Plot Printed and Signed _____		Date _____
Motor Speed _____	Witnessed _____	Date _____
Data Plot Printed and Signed _____		Date _____
Motor Speed _____	Witnessed _____	Date _____
Data Plot Printed and Signed _____		Date _____

Design, Analysis & Discussion of Results (25 pts) _____

Personal Responsibilities (5 pts) _____

Total (50 pts) _____

Name _____

Name _____

Name _____

Name _____



Pre-Project: Be sure that you have a copy of your results from the pre-project test day. Attach these results to your report. Also, follow the procedures described in the pre-project write-up.

Introduction: Project Goals.

The purpose of this project is to build the Beakman’s motor in such a manner that it rotates much faster than the case with the basic design and to determine the speed of the motor by making measurements of currents and voltages in the motor circuit. An explanation of why the motor works as well as it does must be provided. You are allowed to use any spring configuration this term, including springs held in place by one of your team members.

Background

Please read over the background information found on previous Beakman’s motor project write-ups, especially the one from Spring 2007. Pay special attention to the big hint discussion since it describes the benefits of using springs.

Basic Motor Performance (5 pts – Already Assigned to the Pre-Project)

Final Motor Performance (15 pts)

A functioning motor will result in a grade of at least 9. The actual grade will be determined by the speed of the motor. The fastest motor in the class (all sections) will have a grade of 18, the second 17, and the third 16. Of the remaining motors, grades will be based on the following chart:

Speed	Any	20Hz	30Hz	40Hz	50Hz	60Hz	Third	Second	First
Points	9	11	12	13	14	15	16	17	18
History*	1	2	2	2	4	17	147Hz	187Hz	209Hz

*The number of motors or their speed, based on results from Spring 2006
Motor speeds will be posted on the class website. *Have your experimental data signed by a TA or instructor.*

Motor Speed must be recorded and witnessed on the grade sheet (front page of this write up). The signed data plot (obtained with Intuilink) must be consistent with speed recorded on the grade sheet. The data must also be clear. Irregularities in pulses, especially for faster speeds are not acceptable. Pulses must be clear so that the speeds can be determined without any question.

Design, Analysis & Discussion (25 Pts)

Describe the particular design improvements (over the basic design) you have pursued in your motor. Draw a picture of your final design. Your design should be sufficiently



complete so that any reader will understand what you have done and where your model and analysis come from.

Draw a circuit diagram for the motor, including the resistance and inductance of the coil, the back emf of the coil, and the battery. Show the connections to the oscilloscope and the input impedances of the 'scope as circuit components. Determine values for each of the components in your circuit. This can be done using a combination of analysis, experiment, finding published values or judicious guessing. Whenever possible, provide both analysis and experiment. Once you have a complete set of circuit parameters, analyze your circuit either analytically or using a tool like PSpice.

Discuss the features of your data for a slower and a faster motor. The slower motor can be the basic design you did in the pre-project, although you should take the data again to confirm its performance. The faster motor can be your motor with springs. You can also do the same motor with and without springs. This is, in fact, ideal, since you should see some distinct differences in electrical performance to go with the two different speeds. Explain the voltage levels observed in the data using your circuit model. Discuss any odd features that do not seem to be consistent with a simple explanation of the motor. It is a good idea to read over problem 2 of HW8 while doing this project, since it involves one of the key features to look for in the performance of your motor.

Personal Responsibilities (5 pts)

A short paragraph should be written describing what each group member did to develop and implement the final design. It is very important that each member of the group be responsible for some aspect of the design, analysis or testing process. To obtain full credit for this, tasks must be described and assigned to members of the group. If possible, describe how you used some of what you learned in Professional Development I to make your team more successful.

Note: Be sure that you turn in the grading sheet with your official signed speeds and all data signed by a TA or instructor with your report.

Report – In your report, you should only include useful information. Do not pad it with extra materials. All plots should be well annotated so that they can be easily understood without reading any of the text materials. Be sure that you provide information on all reference materials you have used. Do not borrow pictures or any other information from webpages, books, etc. without properly giving clear credit. You are free to use any information at all as long as you give proper credit.