EGS 2321 Engineering Analysis – Dynamics
Instructor: Dr. Kwabena Ofosu, P.E.

Homework 3

Due Date:

Objectives:
The objective of this assignment is to apply concepts we have learned under rigid body motion to your project. You are to then perform sample calculations and work through various scenarios.

To achieve these objectives you must address the following;

Methodology: (30 points)
Identify principles learned under rigid body motion and apply them to your project? For example if you previously analyzed the dynamics of a free-throw in basketball, you may have assumed the ball does not spin. However we know that back-spin is an essential part of throwing the ball to make the score. Identify rigid body motion concepts that will enable you incorporate this rotation into your calculations and present sample calculations for numerous scenarios.

Data: (20 points)
Identify all input parameters and explain how you got the values. For example if you are analyzing the powertrain of an automobile, explain how you got the radius of the flywheel, the diameter of the gear, the mass moment of inertia of the crankshaft and so on. If you are using inputs presented by other authors, provide the reference so an interested third party may look up your references and confirm.

Calculations: (30 points)
Present calculations for numerous and various scenarios of your problem by varying the input parameters and obtaining new results. For example if you are analyzing the flight of a golf ball, how does changing the angular acceleration affect the range of the golf ball? Does it result in a more favorable outcome for the golfer? If you are applying computer programming skills, this is where it will make a difference by enabling you to rapidly run through many simulations. Report any relevant findings whether they are positive or negative outcomes.

Compare your results with those obtained in the previous homework in which you treated your system as a particle and applied the kinematics and kinetics of a particle. How do they compare? Which method gives a more accurate depiction of the reality? Given that rigid body analysis generally requires more computational effort, in your case would you say it was worth the while, or does the kinematics of a particle perspective work just fine?

Special note for those of you doing orbital motion or space mechanics: You are **required** to apply the ideal rocket equation to your space vehicle during the powered flight phase from launch before it is released into free-flight orbit, in addition to the relevant rigid body motion concepts.

Conclusions and Recommendations: (20 points)
Identify any improvements that can be made. Identify further analyses that that may be applicable but is beyond the scope of this class. Usually when conducting studies of this nature, conclusions may raise

questions on some other aspect of your work. What other questions or topics of interest would you like to pursue as a result of what you have learned from this exercise?

Group members:
The output of a group shall be commensurate with the size of the group. For example a group of three presenting say two scenario calculations will be considered insufficient. If you are working in a group, provide a tentative breakdown of each member's contribution to this submittal. A contribution shall involve some analysis or computational input. For example a group member cannot be responsible solely for typing up the reports, she or he must have some substantial contribution involving dynamics, data collection or processing, scenario calculations, or computer programming.