**Engineering Elevators Assignment** Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You are part of an architecture team charged with designing a functional elevator system to access the new luxury boxes in the remodeled Rupp Arena. You have 100,000 dollars to spend, your system must be capable of moving at least 30 people at one time, and the city would like to have as many separate elevators as possible so that the wait time minimized. The average mass of a person is 75 kg. Using the following models create a combination which fulfills the required specifications. (There are actually 2 different combinations that will fulfill the requirements, pick one and explain why you chose that combination).

|  |  |  |  |
| --- | --- | --- | --- |
| Model | Max Upward Acceleration | Max Tensional Force | Cost Per Unit |
| #1 Mini | 3 m/s2 | 4,800 N | $17,000 |
| #2 Mean | 2.5 m/s2 | 9,000 N | $27,000 |
| #3 Max | 2 m/s2 | 13,000 N | $40,000 |

1. Design a **Free Body Diagram** that shows the **Tensional Force** necessary to move and elevator up at a given acceleration.
2. Use the free body diagram to write and equation that solves for **tensional force** in terms of **m, g** and **a**
3. Solve for the capacity or each model of elevator, using the max pull force and the equation written in part B.

**Remember you can’t move only part of a person!!!**

Mini Capacity-

Mean Capacity-

Max Capacity-

1. Using the capacity of each elevator model found in part C and the cost of each model of elevator find a combination that will move 30 riders for under 100,000 dollars. **Remember you can’t move only part of a person or build only part of an elevator!!!**
2. Explain why your solution is the most practical design for the problem.