

Name:**Duration:** 15 min**ID:****Grade:**/30**Questions****Part I: Understand**

(5 pts) Why do we use a gearbox in crane-hoist systems? Explain using your observations during the experiment. HINT: Consider the rated values of the equipment.

(5 pts) Suppose that you are asked to design a motor drive for an elevator. Would you prefer DOL control or VFD? Why?

Part II: Solve

(10 pts) Consider the crane hoist system. Suppose that V/f control is used, the applied frequency is 50 Hz and the system operating in downwards direction at steady state.

What is the direction of the motor torque? Consider that upwards direction corresponds to the positive motor speed.

At which quadrant does the motor operate?

Draw a torque speed curve of the motor and the load torque. Show the operating point.

What is the name of the operating mode?

Part III: Think

(10 pts) Suppose that the crane hoist system is operating at constant speed in upwards direction. Suppose also that you are able to measure motor power output and the linear speed of the tank. Propose a method to calculate the total mass of the tank.