MECH 4430 – 15F – Final Exam

NAME _______________________

- 150 minutes, 50 points, 5 questions, weighted as marked.
- Closed book. Closed notes, except for both sides of one 8½ × 11 in. sheet.
- Unlimited blank scratch paper is allowed.
- Turn in only the attached exam papers.
- Do not detach any of the exam papers.
- Turn in only the attached exam papers. Write only on the front side of each page. Page backs will NOT be scored. Page backs may be used for scratch paper.
- Answers must be presented in an organized manner – disorganized answers will be taken to indicate randomness or incompleteness, and scored as such (you are encouraged to use scratch paper and recopy).

All of the problems on this exam concern an aircraft towing tractor:

![Tractor Image]

- Mass 18,144 kg
- Weight split (f/r) 50/50
- Wheelbase 2311 mm
- Track width (f/r) 2159 mm
- Tires 315/80R22.5 (peak axial friction coefficient 0.7 at 10% slip; peak lateral friction coefficient 0.7 @ 10° slip; pneumatic trail 50 mm)
- Front axle to hitch point 2159 mm

The tractor has four-wheel drive and four-wheel steering. Drive is centralized to a single powertrain, connected to the wheels with a drivetrain of a front/rear differential and two left/right differentials. Each wheel’s steering is unit-controlled (i.e. individual wheel steering motors - no tierods). There is no suspension other than the compliance of the tires. Note that a 3081 mm drawbar is used to connect the tractor hitch point to the aircraft nosewheel.