CE 3500: Exam 2
Friday, April 23
10:00 – 10:50 AM

Name _____

Instructions:

- **SHOW ALL WORK** unless instructed otherwise. No shown work means no partial credit!

- If you require additional space, you may use the back of each sheet and/or staple additional pages to the end of the exam.

- If you need to make any additional assumptions, state them clearly.

- You may use one regular-sized sheet of notes; please turn in the notes with your exam. No additional resources are permitted.

- The number of points associated with each part of each problem is indicated.

Problem	Points	Possible
1		10
2		15
3		15
4		10
TOTAL		50

Problem 1. Short answer. (10 points). Answer the following questions completely, but concisely (emphasis on **short** answer). You may draw a figure if it would be helpful.

1. (6) What three things must a pavement management system do? For each of these, name one reason why that task may be difficult.

2. (4) State the principle of user equilibrium, and specify which step of the four step model uses it.

Problem 2. (15 points.) Hi, I'm sherriff John Bunnell. You may have seen me on award-winning TV shows such as *World's Wildest Police Videos*, *World's Scariest Police Chases*, and *Police Videos*. I've also been studying transportation lately. Maybe you can help me out. In the next 30 minutes you will witness some of the world's worst drivers and the world's wildest police video chases.[1] Due to the graphic nature of this program, viewer discretion is advised.

Miami Florida, home of Disney Land, the Miami Dolphins, and today... *a high speed pursuit*. A man is clocked by a state trooper at 65 mph on Okeechobee Road, where the speed limit is 45 mph. Approaching a 40-foot wide signalized intersection, the light turns yellow when the front end of his vehicle is 450 feet away from the intersection, then turns red five seconds later.

1. (5) Can this man stop in time? Assume a 1 second reaction time and a braking deceleration rate of 11.2 ft/s^2.

2. (5) Is there a dilemma zone for a 12-foot long passenger car traveling at the posted speed limit, assuming the same reaction time and deceleration rate?

3. (5) What is the longest a vehicle can be without causing a dilemma zone, again with the same reaction time and deceleration rate?

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[1]Actually it may be more or less than 30 minutes depending on how long it takes you to solve the problems.

Problem 3. (15 points). The man runs the red light, so the sirens come on. For normal citizens, pulling over is the smart thing to do, *but for criminals, cash is for taking, cars are for chasing, and the law is for breaking.* He veers onto the turnpike and pushes his car to the limit, reaching a speed of 100 mph. Before long, he hits a horizontal curve.

1. (5) My surveyor friend tells me this is a 3-degree curve of length 1500 feet, but that doesn't mean much to me. What are the radius of curvature and intersection angle?

2. (5) There's no superelevation, and the coefficient of side friction is 0.11. Can he navigate the curve safely without slowing down?

3. (5) What is the minimum superelevation which would allow the man to travel the curve at 100 mph (negative answers allowed)?

Problem 4. (10 points). He keeps on running... *straight into the long arm of the law. In this case it was out of the frying pan, into the jail cell*, but on the way he drove through a construction site where a new flexible pavement was being laid, tearing up the asphalt concrete and forcing FDOT to redo the top layer. I'm not very good with pavements... maybe you can help me out here!

1. (4) Draw a cross-section and identify the four layers which play a role in flexible pavement design.

2. (3) The engineer on site remembers that the structural number needed for the top layer was 2.8, where the layer coefficient was 0.34. What was the design thickness for this layer?

3. (3) Is the structural number needed for the top two layers most likely to be greater than, less than, or equal to 2.8? Why?