General examination rules:

1) Do not put your completed work on a desk or on the floor next to you or anywhere it can be seen by others. If any part of your work can be seen by others it will be confiscated and you will not be permitted to rework those problems. **Place it face down on your desk under your existing work.**

2) Please remove your hat. If it is part of your head, turn it around backwards.

3) If your work not legible, or if I cannot follow your logic at a glance, it will receive no credit. This paper will be written to acceptable engineering standards or it will receive no credit.

4) You may work on your own paper or you may use paper supplied at the front of the room.

5) Please read the problem very carefully. Giving the correct answer to something that you weren’t asked is OK, but wastes your exam time.

Ethical Standards:

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System.

"On my honor, as an Aggie, I have neither given nor received unauthorized aid on this exam."

________________________________________
Signature of student

Please do not open this exam until you are told to do so.
Problem 1) (20 points) Write an LP solution to determine the quickest way to go from City B to City I. Times required to travel down the roads are shown on the roads. Times required to travel through the cities are shown inside the circles.
Problem 2) (25 points) Write a BOSS program to determine how long it will take to sink a battleship 2000 meters directly in front of us. At this range the gun we are using has an accuracy which places the shell as far as 900 meters to the right or left of the target, and places it as far as 1500 meters too far or too short of the target, although rarely outside of these limits. Both of these patterns are normally distributed. Shells are fired every 15 seconds. The shells cause damage to the ship in proportion to how far away the shell lands according to the equation \( \text{Damage} = \frac{10,000}{\text{Distance}^{0.5}} \) When the total damage to the ship reaches 20,000 it sinks. Shells which land within 20 meters of the ship sink it immediately.
Problem 3) (10 points) Determine how much money will await me in 10 years if I deposit $1000/month into a 6% savings account.

Problem 4) (10 points) Two competing sewer systems are being considered for a subdivision. System A will cost $2 million and last for 30 years with maintenance costs of $100,000 every 5 years. System B will cost $1.5 million and last 40 years, with yearly maintenance costs of $20,000/year. Determine which of the two systems our city should install if their MARR is 6%.

Problem 5) (10 points) If my MARR is 4%, how much would I be willing to pay for the 9 year bond shown below? Note that there are 9 yearly coupons on the bond.
Problem 6) (25 points) I am presently sitting at Kroger’s making out a 322 final. They just opened. I notice that customers arrive in an exponential distribution about every 20 seconds. 70% of them get a shopping cart, and 20% of them get a small hand basket. The remaining customers get neither a cart (with wheels) nor a hand basket. I further note that they shop for about 30 minutes, normally distributed, with a sigma of 5 minutes, then proceed to one of 4 check-out lines, where it takes them about 4 minutes, exponentially distributed, to pay for their purchase.

Write me a BOSS program to determine if Kroger’s has enough shopping carts and baskets. When I came in I was the first customer and there were 200 carts and 50 baskets available, and I didn’t take one.