

**BAE 590 Spring 2011**  
**Midterm (200pts)**  
**Due by Midnight, Sunday, March 6, 2010**

It is expected that each student will complete his/her own midterm with academic integrity. Students shall follow the NCSU Code of Student Conduct. In addition, your signature below means that you neither gave nor received unauthorized aid. In other words, your signature communicates an understanding of, and adherence to, the University Honor Pledge: "I have neither given nor received unauthorized aid on this test or assignment."

Name: \_\_\_\_\_ Date: \_\_\_\_\_

**Use diagrams and illustrations as needed to explain your answers.**

**Open note and open book. I highly suggest reading through the Reference Report and your class notes. Your answers should be in paragraph format and not a series of fragmented sentences. Grammar is important. Do NOT PLAGIARIZE the 'DRAINMOD Reference Report'. Quote or paraphrase and reference report pages when needed.**

1. (30) DRAINMOD is based on water balance(s) in the field. Explain the two water balances that are used in all applications of DRAINMOD. Write the equations, define each term. What are the time increments over which the water balances are calculated? Note: There are several time increments. I would suggest looking through the Reference Report.
2. (30) DRAINMOD predicts water table fluctuations. How is the soil water distribution above the water table determined?
  - a. When PET is less than upward flux?
  - b. When PET is greater than upward flux?
3. (30) Three equations are used to calculate drainage flux,  $q$ , in DRAINMOD. What are they? Write the equations and explain the conditions under which each is used.
4. (30) Several Objective Functions are calculated in DRAINMOD. Three of them are Trafficability (Number of working days), SEW, and Number of years a site will satisfy the wetland hydrologic criterion. Describe each of these objective functions and the input parameters, and how the model calculates its value. We commonly refer to the  $SEW_{30}$ . Can DRAINMOD be used to calculate  $SEW_{45}$ . If so, what model input(s) would be changed.

5. (35) A 100 ac. wetland restoration area has been established near Wilmington, NC. A ditch along one side provides drainage for a large area upstream and is not controlled by the owners of the wetland restoration area. How would you determine the lateral effect of the ditch on the wetland restoration area? On what soil properties and site parameters would the lateral effect depend? How would you determine those soil property inputs and how would you treat uncertainty in the input values you determine? Define the lateral impact or lateral effect in your answer.
  
6. (20) There are two inputs to DRAINMOD regarding surface storage, Maximum surface storage and a smaller value of surface storage known as Kirkham's depth. How are these values used in determining drainage rates and why is the latter called Kirkham's depth?
  
7. (10) One of the inputs to the model is drainage coefficient. What is the drainage coefficient and how is it used in the model calculations.
  
8. (15) Another input is the lower limit water content. What does the lower limit water content represent and how is it determined. If the lower limit water content of a soil is 0.20 and the saturated water content is 0.45, how much water could be removed from a 30 cm deep root zone in order to meet the ET demand?