**CSES7600 Agroclimatology: Open-book Final Exam**

You have 8-hour window to finish this open-book exam.

Answer the following questions. Please write down all your thoughts and all the procedures. Be as specific and complete as possible.

1. What is the cause of convective rainstorms? What is the cause of orographic rainstorms?

2. What are the names of the components of the surface energy balance?

3. How much daily average latent flux (in W/m2) is equivalent to an evaporation rate of 10 mm d-1?

4. Suppose the temperature is 290K, what is the average atmospheric pressure at 350 m above sea level?

5. What is the saturated vapor pressure at 32 degrees C?

6. For the following information (daily average temperature, Tavg; dew point temperature, Tdewpoint), what is the average daily relative humidity?

* Tavg = 25 C
* Tdewpoint=20 C

7. You are staying in Auburn, Alabama in September 2018. For that day, the minimum temperature is 15C and maximum temperature is 30C. Daily temperature is the average of daily maximum and minimum temperature. Please compute the saturated vapor pressure, slope of the saturated vapor pressure curve. Suppose the extraterrestrial radiation is 117.59 MJ m-2 d-1, also compute the solar radiation using the maximum and minimum temperature approach.

8. Suppose the surface temperature is 22.5 C, how much longwave radiation is emitted from the land surface? (Hint: Use Stefan Boltzmann equation. Assume the emissivity is equal to 1.)

9. List the factors that influence the reference evapotranspiration (ETo), and the factors that influence the crop coefficient (Kc). If the daily average ETo for a crop is 4 mm/day and the daily average crop coefficient is 0.9, what is the daily average crop evapotranspiration? Assume in the soil is relatively dry, resulting in a crop stress factor (Ks) equal to 0.6. What is that adjusted crop evapotranspiration for that day?

10. If the potential crop evapotranspiration for a crop is 510 mm (ETc) and the actual crop evapotranspiration (ETa) is 390 mm, what is the yield reduction? Suppose the crop is 1) Maize (yield response factor is 1.25), and 2) Sorghum (yield response factor is 0.9). Which crop is more resistant to drought.

11. What is the difference between droughts and heat waves? Why do droughts and heat waves occur (describe factors triggering and sustain these extreme events)? What variables and data are needed to characterize these events?

12. What is the most devastating climate hazards in your hometown? Please provide an example. How such climate hazard would be changing in a warming environment? What strategies can be taken to adapt to that change and build resiliency?