

CRSS(FORS) 3060 - Soils and Hydrology - Exam 3

1. (3 points) West Point Lake (near Columbus, GA) holds approximately 500,000 Acre-Feet of water when full. What is the average residence time of water in the reservoir if the flow into the lake is 1,000 cfs?
2. (3 points) What is the average depth of West Point Lake if the surface area of the lake is 41 mi²?
3. (3 points) What is the average runoff depth (inches/yr) from the 3,440 mi² watershed upstream of the reservoir corresponding to the inflow?
4. (2 points) What kind of air mass was here in Athens on Sunday?
5. (2 points) Which kind of front yields precipitation with high intensity and short duration?
6. (2 points) Why is the wet air lapse rate less than the dry air lapse rate?
7. (3 points) Use the dry air lapse rate to find the temperature at 3000' if the temperature on the coast is 45F.
8. (2 points) What rainfall mechanism caused the record rainfall in Charrapunji, India, from 1860-61?
9. (5 points) Using the rainfall intensity - duration plot for Atlanta, Georgia, in Chapter 10 of your notes, find the total precipitation for the extreme 10-year precipitation event.

	Storm Duration			
	10 min	30 min	1 hour	6 hour
Intensity (in/hr)				
Total Depth (in)				

10. (3 points) What is the volume of a soil sample, in cm^3 , collected in a metal ring (diameter = 4", height = 2")?
11. (3 points) What is the bulk density, g/cm^3 , of the soil if the oven-dry weight is 21.8 ounces?
12. (3 points) What is the porosity of the soil?
13. (12 points) Complete the following table using the above information.

	Soil Condition				
	Saturated	Field Capacity	Wilting Point	Air Dry	Oven Dry
soil mass, g		763	661	636	
water mass, g					
θ_g					
θ_v					

14. (3 points) What is the maximum depth of available water (in inches) if the soil is 6 inches deep?
15. (7 points) Soil tensions were measured at various depths in a soil profile. Complete the following table:

Elevation	Tension	Total Head	Gradient
100	100		
95	90		
90	60		
85	50		
80	50		
75	50		
0	0		

16. (3 points) At what depth is the water table?
17. (3 points) At what depth does the flow reverse direction?

18. (3 points) What might cause the upward water flow?
19. (3 points) Where is the hydraulic gradient largest?
20. (2 points) What are the dominant forces (sources of energy) that cause water to move in soils?
21. (2 points) Why is the subsurface humidity (soils, caves, basements, etc.) generally so high?
22. (2 points) Why do fine-textured soils (clays) generally hold water more strongly than coarse soils (sands)?
23. (6 points) Complete the following table. Assume that the maximum available storage within the rooting zone is $S = 3$ inches.

		Week						
		1	2	3	4	5	6	7
F								
K_s	F/S							
K_c	given	0.10	0.40	0.70	1.00	1.00	1.00	0.90
PET	given	1.40	1.55	1.70	1.90	2.30	1.90	1.75
AET	$K_c K_s PET$							
F'	$F - AET$							
P	given	1.05	0.00	6.20	0.00	1.20	0.00	0.00
F''	$F' + P$							
Q	$F'' - S$							
F'''	$F'' - Q$							

24. (3 points) The table above is done on a weekly basis instead of daily. Would a daily water budget be more or less accurate than the weekly budget? Why?
25. (2 points) Identify a method for obtaining the PET data given in the table above. Why would you use this method instead of some other method?