

CE 3354 Engineering Hydrology
Exercise Set 1

Exercises

1. Using the internet, textbook(s), and the on-line reading collection define the following (in a sentence or two); please cite your references (URL is sufficient):
 - (a) Alluvium
 - (b) Bankfull Discharge
 - (c) Best Management Practice
 - (d) Drainage Divide
 - (e) Evaporation
 - (f) Evapotranspiration
 - (g) Precipitation
 - (h) Flow Duration Curve
 - (i) Flood Frequency Curve
 - (j) Watershed
 - (k) Catchment
2. Assuming that all water in the oceans is involved in the hydrologic cycle, estimate the average residence time of ocean water. [Problem 1.1.1 in Chow, Maidment, and Mays]
3. Assuming that all surface runoff to the oceans comes from rivers, estimate the average residence time of water in rivers. [Problem 1.1.2 in Chow, Maidment, and Mays]
4. The equation $k \frac{dQ}{dt} + Q(t) = I(t)$ has been used to describe the response of streamflow to a constant rate of precipitation continuing indefinitely on a watershed. For this problem, let $I(t) = 1$ for $t > 0$ and $Q(t) = 0$ for $t = 0$. Plot values of $I(t)$ and $Q(t)$ over a 10-hour period if $k = 2$. [Problem 1.3.2 in Chow, Maidment, and Mays]¹

¹You will need to solve the differential equation

5. Figure ?? is a schematic of a 600-hectare farm; the land receives annual rainfall of 2500 mm. There is a river flowing through the farm land with inflow rate of $5 \text{ m}^3/\text{s}$ and outflow rate of $4 \text{ m}^3/\text{s}$. The annual water storage in the farm land increases by $2.5 \times 10^6 \text{ m}^3$. Using the water budget concept, estimate the annual evaporation amount in millimeters.²

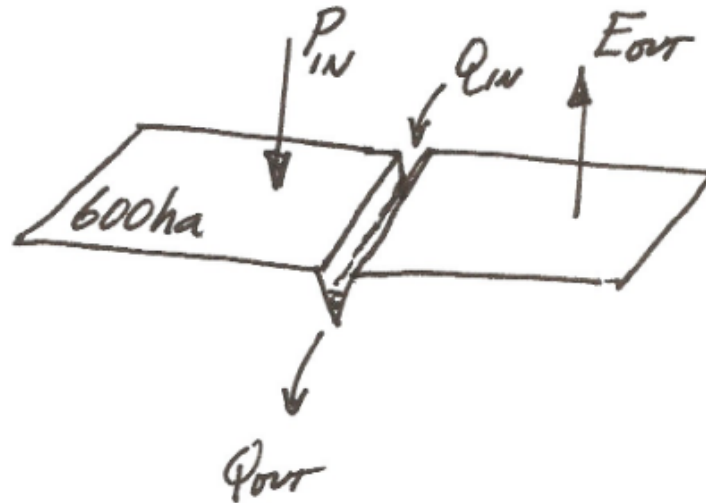


Figure 1: Schematic of Farmland

6. A reservoir has a surface area of 690 acres. Figure ?? shows the monthly inflow of surface water, outflows as releases from the reservoir via the spillway, direct precipitation into the reservoir, and evaporation from the reservoir. The reservoir water surface elevation was 701.0 feet on January 1. Determine the reservoir water surface elevation at the end of each month (i.e. complete the table)

²1 hectare = 10,000 m²

Lake Woodlands									
Average Surface Area = 690 acres									
Month	Inflow (acre-feet)	Outflow (acre-feet)	Precipitation (inches)	Precipitation (acre-feet)	Evaporation (inches)	Evaporation (acre-feet)	Storage Net Change (acre-feet)	Elevation Change (feet)	Water Surface Elevation (feet)
December									701.00
January	1732	175	2.75	158.13	1.05	60.38	1654.75	2.40	703.40
February	1755	190	3.05		1.55				
March	872	232	3.76		2.05				
April	955	375	4.11		2.80				
May	708	525	2.70		3.75				
June	312	955	1.05		4.25				
July	102	1720	0.75		5.15				
August	37	2250	1.25		5.76				
September	175	1575	1.55		4.92				
October	575	550	3.79		3.02				
November	1250	175	4.53		1.75				
December	1875	125	5.01		0.60				

Figure 2: Tabular Water Budget Values