CE 3354 Engineering Hydrology
Exercise Set 1

Exercises

1. A farm has a reservoir with vertical sides and surface area of 2.5 acres. Following the reservoir has accumulated 9.84 feet of water. During the dry season the reservoir loses 2.5 inches of water per week to evaporation. The average irrigation demand during the dry season is 0.23 acre-ft per day.

   Determine:

   a) How many weeks can the farm irrigate water from the reservoir supply?

2. The mean annual precipitation for a certain 132 square-mile watershed is 25 inches. Assume that 20 percent of the annual precipitation reaches the watershed outlet as streamflow.

   Determine:

   a) The mean streamflow rate in acre-feet per year.

   b) The mean streamflow rate in cubic-feet per second.

   c) The mean streamflow rate in cubic-meters per second.

3. The mean annual rainfall depth over a 280 km^2 watershed is 725 mm.

   Determine:

   a) The mean annual volume of rain falling on the watershed in cubic meters.

   b) The mean annual volume of rain falling on the watershed in cubic feet.

   c) The mean annual volume of rain falling on the watershed in gallons.

   d) The mean annual volume of rain falling on the watershed in acre-feet.

4. Figure 1 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 m^3/s and outflow rate of $4m^3/s$. The annual water storage in the farm land increases by $2.5\times10^6 m^3$. Using the water budget concept, estimate the annual evaporation amount in millimeters.[1]

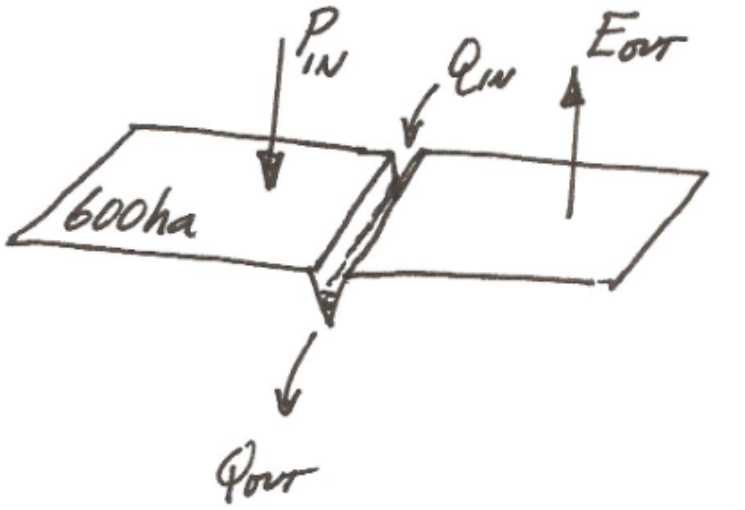

Figure 1: Schematic of Farmland

[1] 1 hectare = 10,000 m^2

5. A reservoir has a surface area of 690 acres. Figure 2 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)

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