CE 3372 – Water Systems Design
Exercise Set 7

Purpose: Apply rational method by-hand; construct a design storm hyeto-
                                          graph

ABET General Criteria 3:   (a) ... apply knowledge of mathematics, science, and engineering
                                          (e) ... solve engineering problems
                                          (k) ... an ability to use the techniques, skills, and modern engi-
                                          neering tools necessary for engineering practice.

Exercises

1. A square shaped 250 acre, single family residential area in Harris County ranges in
   elevation of 150-feet at the North corner to 139-feet at the South corner outlet as
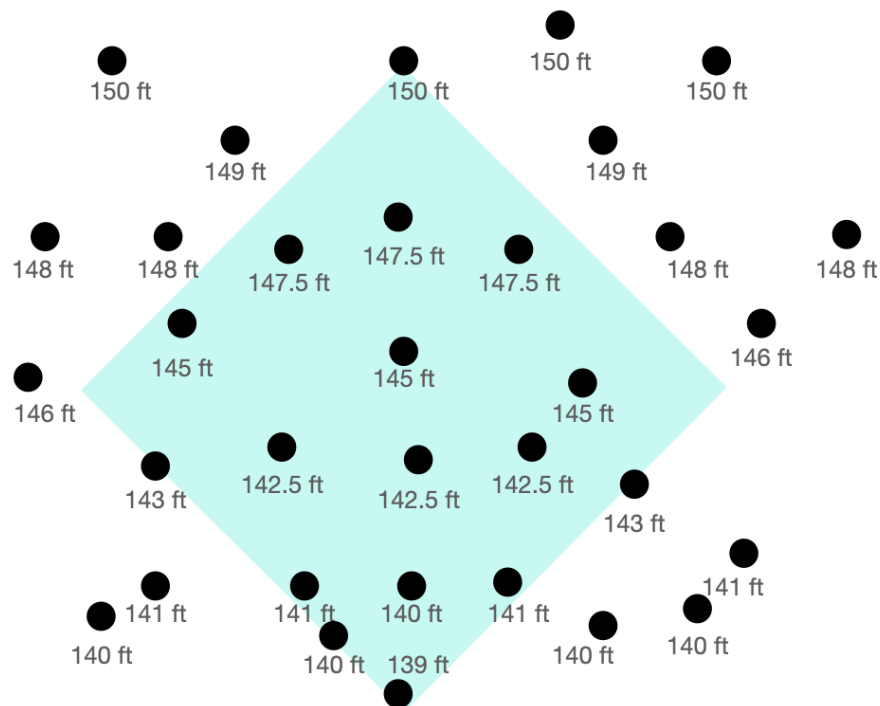   depicted on Figure 1.

Figure 1: 250 acre square watershed with land surface elevation points indicated

   a) Create an elevation contour map for the study area – the shaded area is square, 250 acres total area.

   b) Draw representative overland flow paths on the map (or diagram)

   c) Draw on the diagram the longest flow path from the highest elevation to the outlet that lies within the 250 acre study area.

   d) Draw on the diagram the shortest flow path from the highest elevation to the outlet that lies within the 250 acre study area.

   e) Determine the length, in feet, of both flow paths.

   f) Determine the average dimensionless slope along each flow path.

   g) Estimate the time of concentration using NRCS upland method.

   h) Using the NOAA Atlas 14, Volume 10 for Texas estimate the rainfall intensity for a 10-year ARI, 3-hour duration storm.

   i) Using (and citing) a runoff coefficient table, specify the runoff coefficient for the sub-catchment.

   j) Estimate the peak discharge for the sub-catchment for a 10-year ARI using the Rational Method.

2. Using the SCS Tabulation or TXHYETO, construct from the 10-year, 3-hour storm a design hyetograph at 15 minute intervals.