CE 413 Homework III

Fall 2018 Due November 2 B.A. DeVantier

Problem 1 (double value of Problems 2-5)
Apply the simpler I-D-F model described in class:

$$i = \frac{cT^m}{D + f}$$

in an Excel Solver least squared error fit of the Cairo curves supplied in supplemental material and **supplied again on the second page** of this document. Use at least three points on each supplied curve in the figure, using points at either end and the middle, where you can most accurately read values. Use the model to **add 80 year curve to the supplied sheet**.

Problem 2
Class text problem 7.16 with text t_c from FAA (solve iteratively and recalculate channel velocity). Note that this problem is similar to text Example 7.6, but with more than twice the size of drainage area and a return period of 50 years rather than 25.

Problem 3
Rework class text problem 7.16 using NRCS t_c estimating NRCS parameters from supplemental reading material. Note that this problem is similar to text Example 7.6, but with more than twice the size of drainage area and a return period of 50 years rather than 25.

Problem 4
For a design storm of 6 in/hr for 2 hours, produce an NRCS triangular UH for a 600 ac watershed having a slope of 0.02, flow length from most remote watershed point to collection point of 4430 ft, and CN = 65 (use NRCS t_c). Verify that the NRCS time to peak is 1.25 hours and thus the unit hydrograph duration D is 0.25 hr and apply a spreadsheet to generate the composite hydrograph for the design storm.

Problem 5
Design storm water inlets for a storm of intensity 4.0 in/hr onto a two lane road with float finish pavement, and each side having a width of 18 feet and a maximum encroachment of 4 ft. The transverse slope is to be 2.5% and the roadway slope is 1.0 %. Determine the spacing along the roadway for flush grate inlets of thickness 0.5 in, as well as appropriate grate horizontal dimensions.

Problem 6 (double value of Problems 2-5)
Recalculate and plot the hydraulic elevation profile on the following sheet for class text Example 7.10 on the provided third sheet.

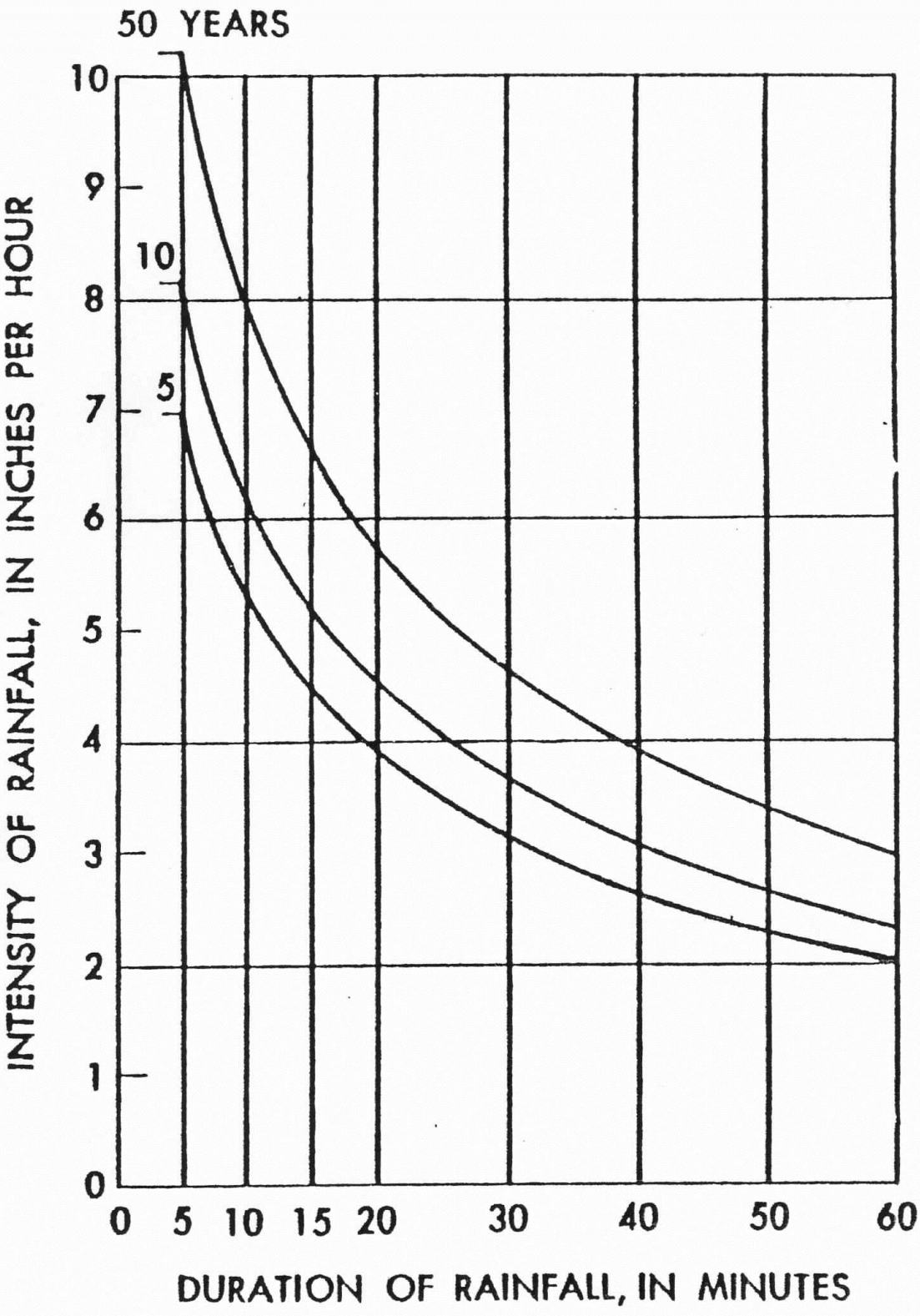
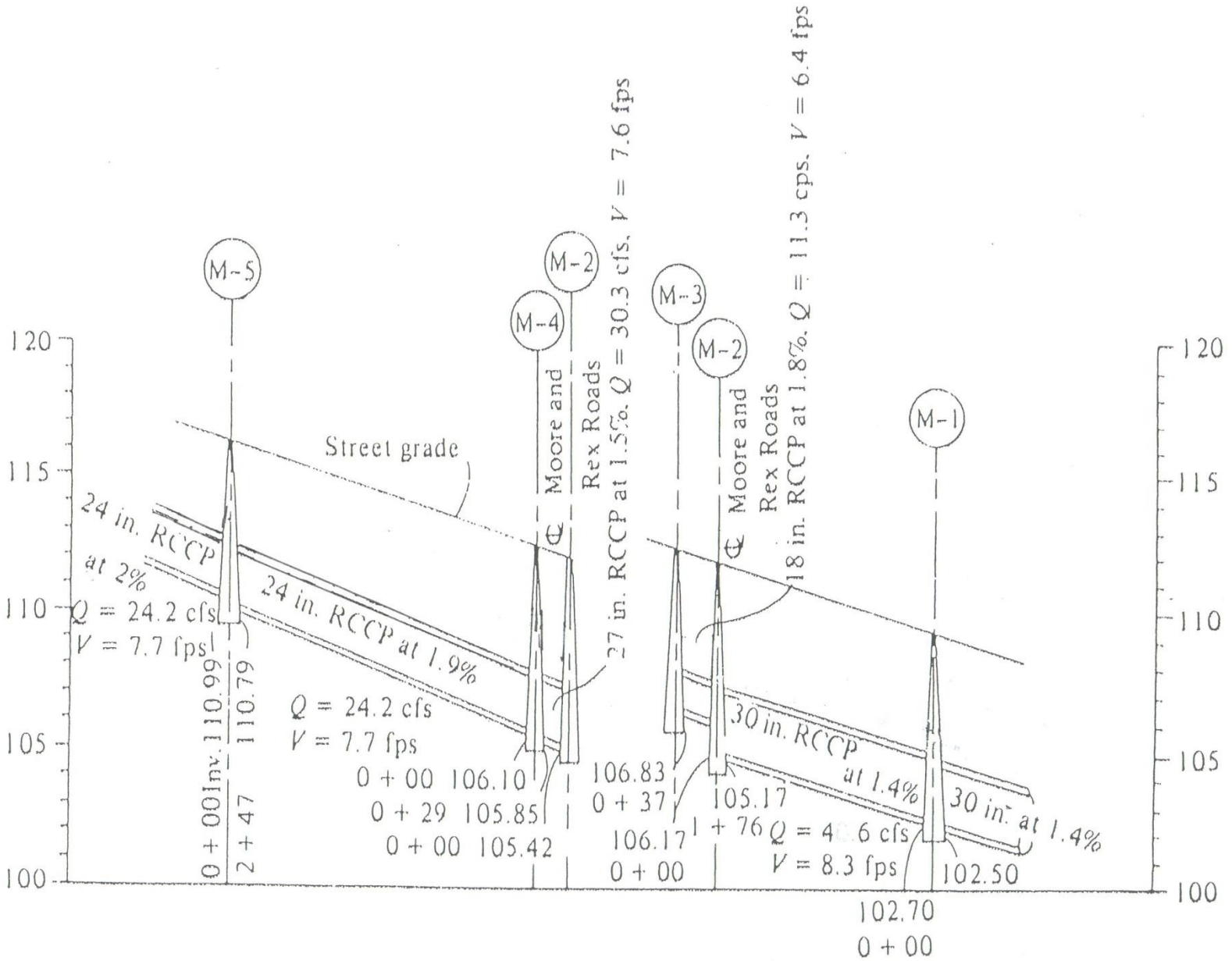


Figure II-12.—Intensity curves for storms in the vicinity of Cairo, Illinois.


M-5
M-4
M-2
M-3
M-2
M-1
120
115
110
105
100
Street grade
24 in. RCCP
at 2%
Q = 24.2 cfs
V = 7.7 fps
24 in. RCCP at 1.9%
Q = 24.2 cfs
V = 7.7 fps
27 in. RCCP at 1.5%. Q = 30.3 cfs. V = 7.6 fps
18 in. RCCP at 1.8%. Q = 11.3 cps. V = 6.4 fps
Moore and
Rex Roads
Moore and
Rex Roads
30 in. RCCP
at 1.4%
30 in. at 1.4%
Q = 4 6 cfs
V = 8.3 fps
0 + 00 Inv. 110.99
2 + 47 110.79
0 + 00 106.10
0 + 29 105.85
0 + 00 105.42
106.83
0 + 37
106.17
0 + 00
105.17
1 + 76
102.50
102.70
0 + 00