HANDOUT #7

CE315 Hydrology

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RAINFALL CALCULATIONS

Table 2.4. Distribution of rainfall during a storm on the University of Georgia White-hall Forest in June, 1990 (Brown, 1993).

Time, min	Amount, mm
5	1.5
10	5.6
15	13.0
20	5.8
25	5.1
30	9.7
35	4.8
40	1.3

Example 2.4: For the rainfall amounts shown in Table 2.4, calculate a) the total rainfall amount; b) the duration; c) peak intensities for 5 min, 10 min, and 30 min; and d) the average intensity.

Solution:

a) The total rainfall amount is the sum of the individual amounts in Table 2.4.

$$Amount = 1.5 + 5.6 + 13.0 + 5.8 + 5.1 + 9.7 + 4.8 + 1.3 = 46.8 \text{ mm}$$

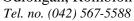$$46.8 \text{ mm} \div 25.4 \text{ mm/in.} = 1.84 \text{ in.}$$

b) The duration is the length of time from the beginning of the storm until the end of the storm. In Table 2.4, the time is given in minutes from the beginning of the storm, which gives a total duration of 40 minutes.

c) The 5-minute peak intensity occurs between 10 and 15 minutes when 13 mm of precipitation is measured:

$$Intensity = 13 \text{ mm} \times \frac{60 \text{ min/hr}}{5 \text{ min}} = 156 \text{ mm/hr}$$

or

$$\frac{156 \text{ mm/hr}}{25.4 \text{ mm/inch}} = 6.14 \text{ inches/hr}$$

The 10-min intensity can be found by comparing each 10-min period to find the period which receives the greatest amount of rainfall. The period is between 10 and 20 minutes, with a total rainfall of 13.0 + 5.8 mm = 18.8 mm. The intensity is

$$\frac{18.8 \text{ mm}}{25.4 \text{ mm/inch}} \times \frac{60 \text{ min/hr}}{10 \text{ min}} = 4.44 \text{ inches/hr}$$

By the same procedure, the maximum 30-min rainfall intensity is determined. The maximum the 30-min rainfall between 5 and 35 minutes is:

$$5.6 + 13.0 + 5.8 + 5.1 + 9.7 + 4.8 = 44.0 \text{ mm}$$

so the 30-min intensity is:

$$30\text{–min intensity} = \frac{44 \text{ mm}}{25.4 \text{ mm/inch}} \times \frac{60 \text{ min/hr}}{30 \text{ min}} = 3.46 \text{ inches/hr}$$

d) The average intensity is the total rainfall amount divided by the storm duration:

$$\text{Average Intensity} = 1.84 \text{ inch} \times \frac{60 \text{ min/hr}}{40 \text{ min}} = 2.76 \text{ inches/hr}$$