

**CE 3372 Water Systems Design**  
**Exam 2**  
**Spring 2025**

1. (XX5 points) Consider the drainage area depicted in Figure ???. The 6.0 acre drainage area has a runoff coefficient of 0.65, and an inlet time (time of concentration to the inlet depicted in the figure) of 17 minutes. The pipes are concrete (Manning's  $n = 0.013$ ). The initial invert elevations for the junction boxes (MH-1, MH-2, MH-3) are 323.2, 321.1, and 319.0 feet, respectively.



**Figure 1.** Drainage System Layout.

Equation ?? is the 10-year ARI intensity equation for the area, where  $I$  is intensity in inches-per-hour, and  $T_c$  is the characteristic time, in minutes.

$$I = \frac{56.6}{(T_c + 8.6)^{0.823}} \quad (1)$$

- a) What is the dimensionless slope of the pipe run P1 (connecting MH-1 and MH-2)?
- b) What is the dimensionless slope of the pipe run P2 (connecting MH-2 and MH-3)?
- c) What is the  $CA$  value for drainage area DA-1?
- d) What is the  $\sum CA$  value (sum of the upstream products of runoff coefficients

and contributing areas) at junction MH-1?

- e) What is the  $\sum CA$  value (sum of the upstream products of runoff coefficients and contributing areas) at junction MH-2?
- f) What is the time of concentration to be used to compute the discharge leaving MH-1?
- g) What is the rainfall intensity for this time of concentration?
- h) What is the value of peak discharge leaving MH-1?
- i) What is the pipe diameter for pipe P-1 required to carry the design flow at full pipe depth?
- j) What is the flow velocity in pipe P-1?
- k) What is the pipe travel time for pipe P-1?
- l) What is the value of peak discharge leaving MH-2? (Explain your reasoning)
- m) What is the pipe diameter for pipe P-2 required to carry the design flow at full pipe depth?
- n) What is the flow velocity in pipe P-2?

- o) What is the pipe travel time for pipe P-2?