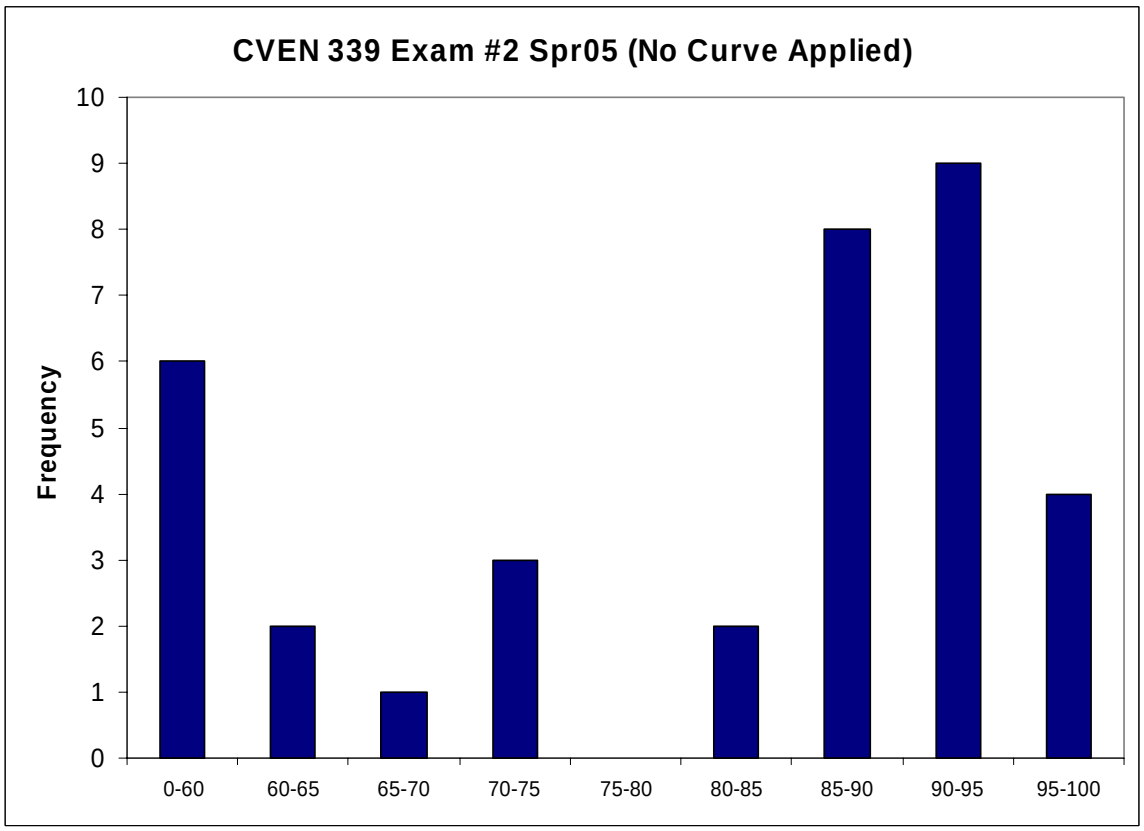
CVEN 339 – Spring 2005 – Exam #2

60 minutes allowed

No Curve Applied

Median	88.5
Mean	80.6
Std. Dev.	16.3
High	97



Name: _____

CVEN 339 – Water Resources Engineering
Spring Semester 2005
Dr. Kelly Brumbelow, Texas A&M University

Exam #2

Open-book, Open-notes (2 questions)

1. A water audit is to be performed for a city's water distribution system. In this audit, all system inflows, outflows, and storage quantities are to be determined (i.e., a water balance is to be calculated), and that data is to be used to quantify water losses from the system. Losses are separated into 3 categories: (1) leaks from pipes in the distribution network, (2) overflows of water at storage tanks, and (3) "apparent losses" due to data measurement errors. A form of an apparent loss is when a meter under-reports a water volume: if a meter's accuracy value is 75%, then for each 1 gallon of water that flows through the meter, only 0.75 gallons are recorded and 0.25 gallons are "apparently lost."

On the next page is a schematic map of the city water system including the wells where water enters the system, storage tanks where water is stored, customer usage meters at demand nodes, and a few intermediate flow meters (the assumed direction of flow is marked with an arrow for these meters). Given below are tables of relevant data for a three-day period. For this entire period, *determine volumes of water losses categorized as leaks, storage overflows, and apparent losses.* (60 points)

Please write answers below:

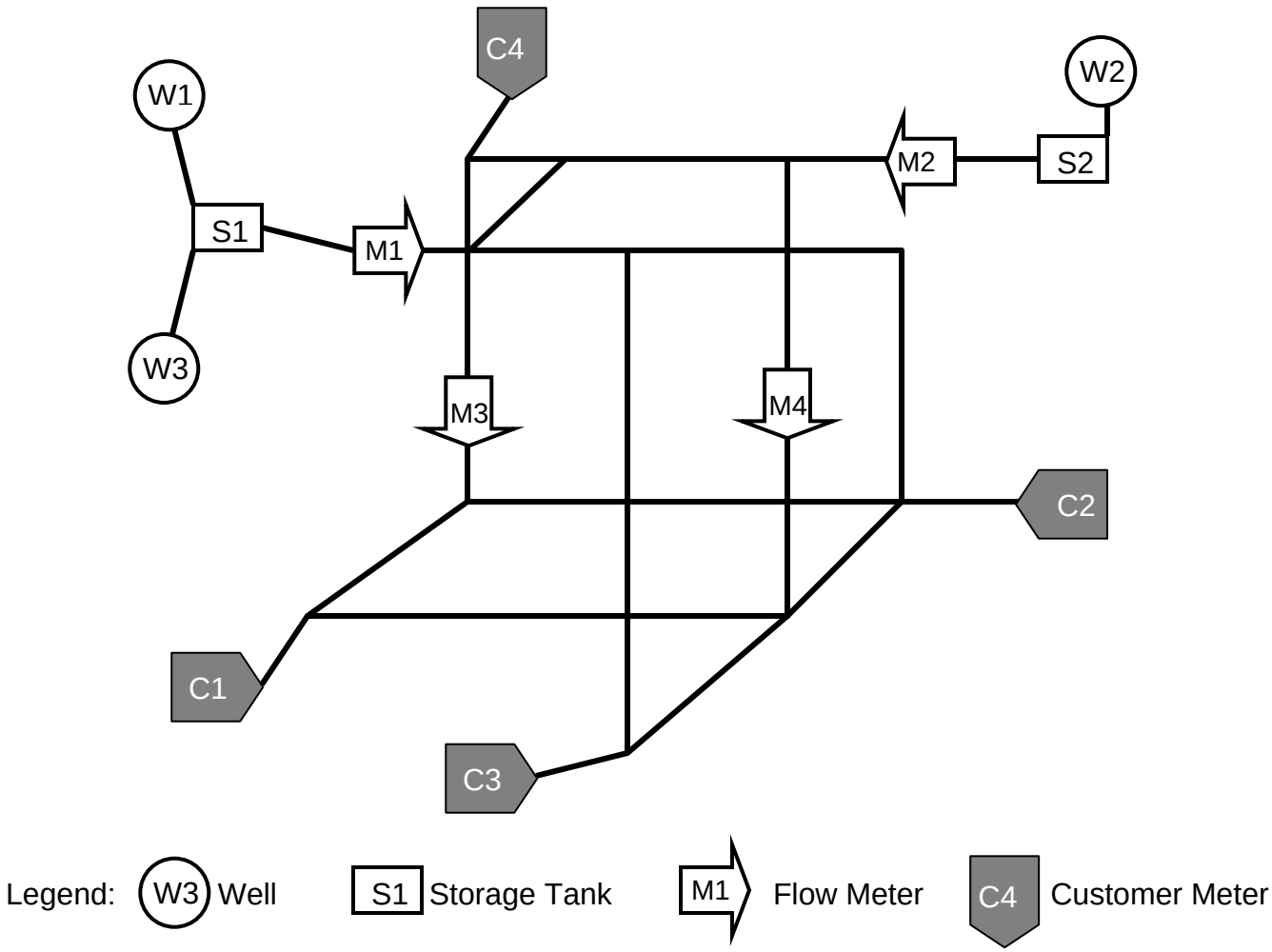
Volume of pipe leaks _____ gallons

Volume of storage tank overflows _____ gallons

Apparent losses due to meter inaccuracy _____ gallons

Storage Tanks S1 and S2 each have a capacity of 100,000 gallons.

	Storage in Tank (gallons)			
	Start of Day 1	Start of Day 2	Start of Day 3	End of Day 3
Storage Tank S1	90,000	94,400	100,000	98,000
Storage Tank S2	95,000	97,000	100,000	99,700



	Measured Daily Flow (gallons/day)		
	Day 1	Day 2	Day 3
Well W1	5,000	8,000	500
Well W2	2,500	4,450	200
Well W3	3,000	2,500	0
Flow Meter M1	3,600	3,400	2,500
Flow Meter M2	500	1,450	500
Flow Meter M3	600	950	350
Flow Meter M4	1,000	1,400	1000
Customer Meter C1	500	800	200
Customer Meter C2	1,000	1,200	800
Customer Meter C3	1,200	1,500	1,000
Customer Meter C4*	560	400	400

* Customer Meter C4 was recently tested and found to have an accuracy value of 80%. All other meters are assumed to have 100% accuracy.

2. A 50 acre watershed is covered entirely by suburban residential development with average lot sizes of 1/3 acre. The soil in the watershed is a clay loam with an average infiltration rate of 0.1 in/hr (0.254 cm/hr). At the beginning of a particular storm the soil is saturated with moisture. The storm rains 5.50 inches in 60 minutes with an even distribution of rainfall rate throughout the storm period.

(a) Using the NRCS Curve Number and Dimensionless Hydrograph methods, determine the peak runoff flowrate resulting from this storm on this watershed.

(b) Using the Rational method, determine the peak runoff flowrate resulting from this storm on this watershed. Provide explicit justification for your choice of value for the runoff coefficient C.
(40 points)