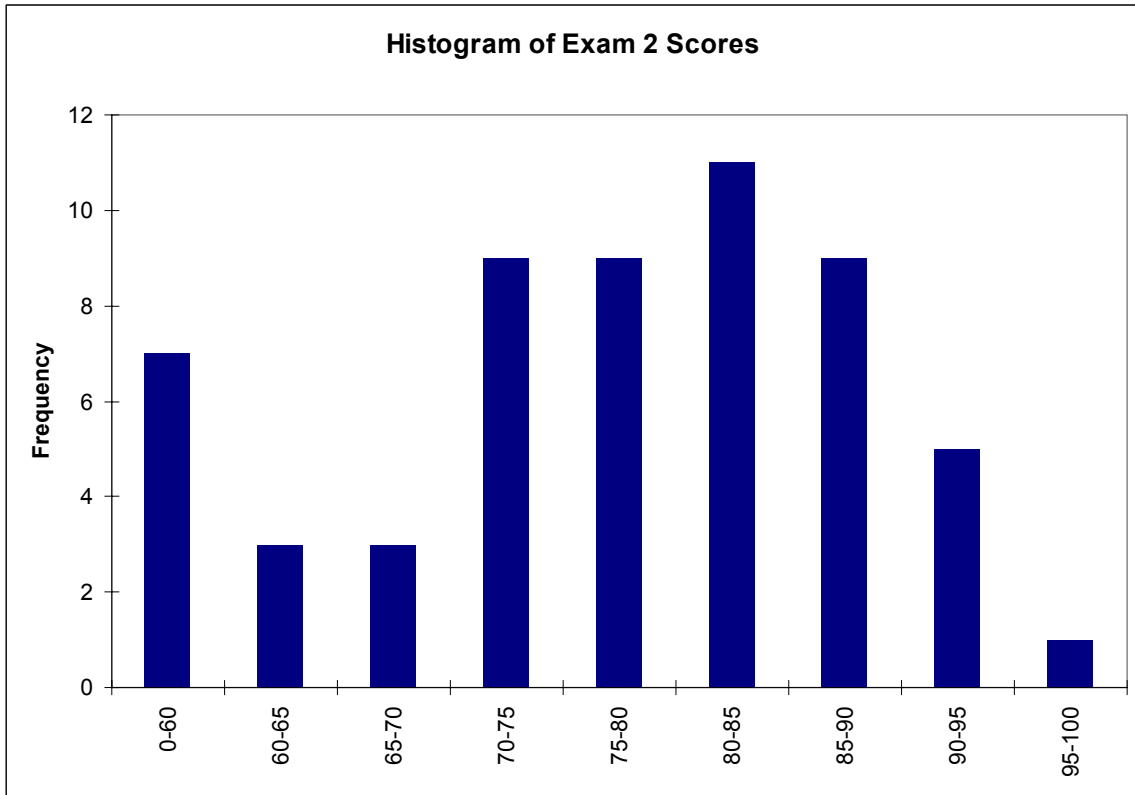


CVEN 339 – Exam #2 – Spring 2003

Grade Statistics

Median 79.0  
Mean 76.9  
Std. Dev. 12.6  
Maximum 100  
Minimum 38.0



Name: \_\_\_\_\_

CVEN 339 – Water Resources Engineering  
Spring Semester 2003  
Dr. Kelly Brumbelow, Texas A&M University

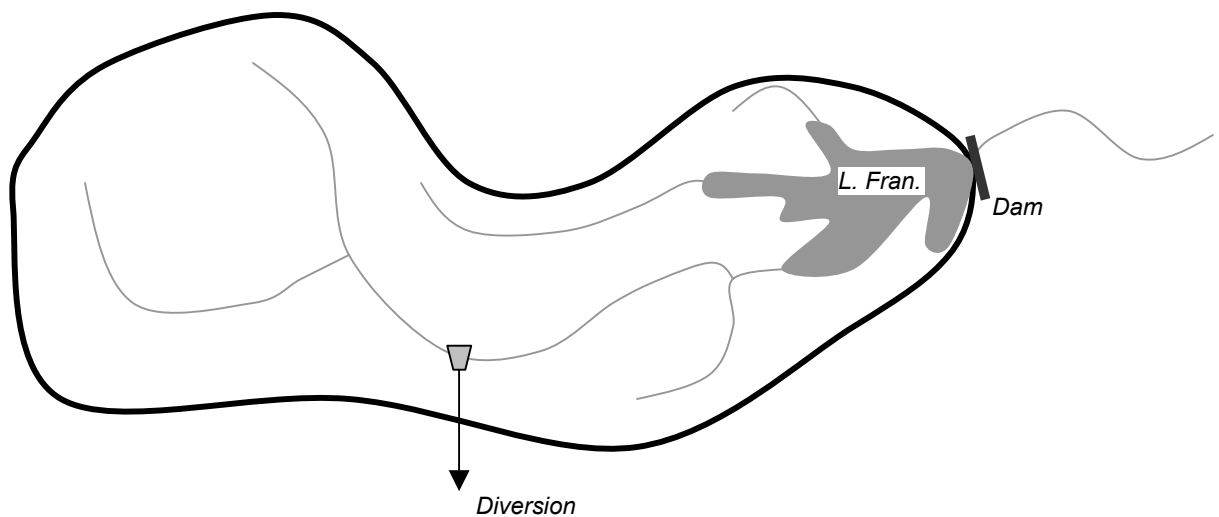
Exam #2

**Open-book, Open-notes (6 pages, 3 questions)**

1. Lake Franchione has an area of 4,500 acres (invariant with depth). The watershed draining to this lake is 764 mi<sup>2</sup> in area (not including the lake area). There is no significant aquifer under either the lake or its watershed. Mean areal precipitation and evapotranspiration on the watershed are 34.54 inches and 26.84 inches, respectively, each year. The lake experiences mean precipitation and evaporation of 39.06 inches and 34.72 inches, respectively, each year.

A man-made dam was constructed at the outlet point of the lake to control lake outflow. The outflow rate through the dam is set each January 1, and held constant until the next January 1. The outflow rate is computed as  $Q_{dam} = 0.0436 \cdot S^{1.08}$ , where  $S$  is the storage (volume) of water in the lake on January 1 in acre·feet, and  $Q_{dam}$  has units of acre·feet/year. Prior to construction of the diversion described below, a steady-state condition exists for the lake.

A water diversion project is constructed to take water out of one of Lake Franchione's tributaries and carry it out of the watershed. If the diversion is 50,000 acre·feet the first year, what will be the outflow rate from Lake Franchione the next year? Specify your answer in acre·feet/year. (35 points)

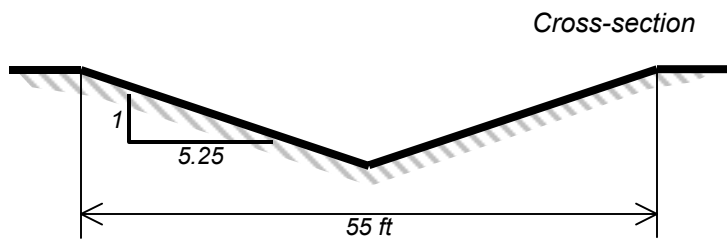


2. A 1,305 acre watershed is composed of degraded rangeland having only about 20% coverage of the ground by vegetation. The watershed's soil is an NRCS type D clay. Base flow at the watershed outlet is 16 cfs. If a storm of duration 120 minutes rains 6.73 inches on the watershed, how long will streamflow at the outlet be above 530 cfs? A 2 hour-unit hydrograph for this watershed is provided below for your use. (30 points)

<b>Time (hrs)</b>	<b>2 hr-U.H. (cfs/in)</b>
0	0
1	39
2	96
3	168
4	209
5	201
6	170
7	142
8	102
9	75
10	50
11	29
12	19
13	11
14	5
15	0

3. Hydrologic analysis of a proposed development area has produced the hydrograph given below as the outflow from a particular watershed. Another engineer in your firm has designed a grass-lined swale to carry drainage from the watershed's outlet to a detention basin (distance of 450 ft) as a subcritical flow. You have been asked to check the design (details given below). Does the channel design meet the criteria discussed in class? A successful design would meet criteria for Froude number, freeboard, maintenance considerations, and shear stress, at minimum. (35 points)

Time (hrs)	Discharge (cfs)
0	0
2	32
4	70
6	57
8	34
10	17
12	6
14	0



$$S_o = 0.0022$$

Channel sides to be planted in buffalo grass maintained at 3-6 in height ( $n = 0.027$ ;  
 $\tau_{max}$  listed as 0.60 psf in design manuals)