

CIE 272

Civil Engineering Measurements

Exam #2

November 17, 2003

Directions:

1. Write your name on your exam book, NOW!
2. **Read the questions carefully.** Most errors on timed examinations are the result of not understanding what is being asked.
3. **DON'T PANIC!** You may answer the questions in any order, so read through the exam, and do the easier problems first.

Good Luck!

1. (20 Points) If Z is a standard normal random variable, then determine:

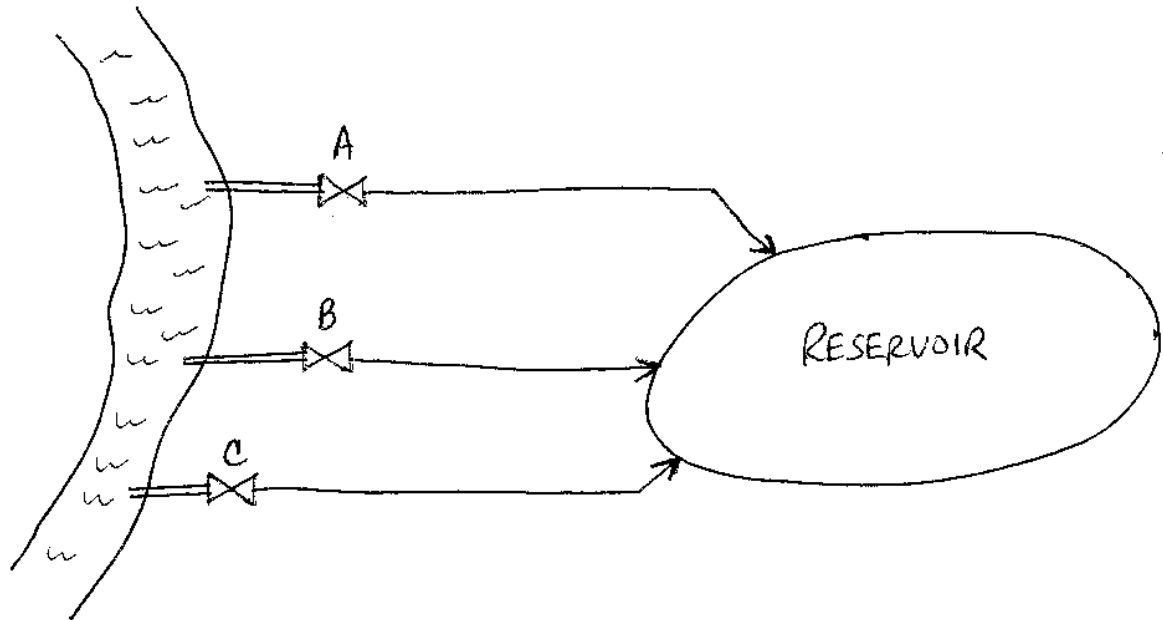
- a. (4) $P(Z \leq -1.77)$.
- b. (4) The z value such that $P(Z = z) = 0.015$.
- c. (4) $P(+0.51 = Z = +2.00)$.
- d. (4) The z value such that $P(Z > z) = 0.039$.
- e. (4) The z value such that $P(-1.18 \leq Z \leq z) = 0.60$.

2. (30 Points) The data in the table below are the magnitudes of major earthquakes in California between 1852 and 1994. They have been ordered for your convenience.

6.0	6.5
6.0	6.5
6.0	6.5
6.0	6.5
6.0	6.6
6.0	6.6
6.0	6.7
6.0	6.7
6.0	6.8
6.0	6.9
6.0	6.9
6.0	7.0
6.1	7.3
6.1	7.3
6.1	7.5
6.1	7.8
6.2	
6.2	
6.2	
6.2	
6.2	
6.2	
6.3	
6.4	
6.4	
6.4	
6.4	
6.4	
6.4	
6.4	
6.5	
Mean	6.40
Std. Dev.	0.44

- (10) Determine the median and quartile values for these data.
- (10) Draw a histogram using intervals of 0.3 magnitude units.
- (10) Would it be appropriate to use the normal distribution with these data? **Explain your answer.**

3. (25 Points) A city uses three pumps to carry water from a river to a reservoir. Pumps A and B are new, and have a probability of failing of 0.02 on any day. Pump C is older, and has a probability of failure of 0.15 on any day.



Pumps A and B operate Monday-Friday. On Saturday, pumps A and C operate while pump B is serviced. On Sunday, pumps B and C operate while pump A is serviced.

Answer the following questions, assuming that the pumps operate independently of one another, and independently from day to day.

- (5) Determine the probability that pump A works on any day that it is in use.
- (5) Determine the probability that pumps A and B both fail on any day that they are in use.
- (5) Find the probability that at least one pump fails on any Saturday.
- (5) Find the probability that pump B works, and C fails on any Sunday.
- (5) Determine the probability that no pumps fail in a week.

4. (25 Points) “Piles” are long steel or iron rods that are driven into the ground to stabilize the foundation of a building. A contractor has driven piles on ten jobs in the Syracuse area. The data in the table below show the results of those projects.

Job	Total Piles Driven	Piles Failed	Fraction of Failed Piles
1	40	2	0.050
2	35	3	0.086
3	42	1	0.024
4	28	2	0.071
5	38	2	0.053
6	61	4	0.066
7	18	0	0.000
8	36	1	0.028
9	52	3	0.058
10	27	2	0.074
Mean	37.70	2.00	0.051
Std. Dev.	12.37	1.15	0.026

- a. (15) Compute the 99% confidence interval for the fraction of failed piles.
- b. (10) The contractor is bidding for a large project that requires 75 successful piles. How many should he plan to drive? **Explain your answer.**

Extra Credit (Max. Exam Score = 100)

(10 Points) Find the value of z such that $P(-2z < Z < z) = 0.6$