MIDTERM - STATISTICS 302 (Section 202)

March 8, 2010

Student Name (Please print): ....

Student Number: ....

Notes:

- Total points equal 100.
- Show the work leading to your solutions in the space provided. Indicate clearly the part of the problem to which the work relates.
- This is a closed book midterm.

[**25**] <u>Problem 1</u>: Two friends, John and Linda, take the Stat 302 midterm exam. They have **equal probability** of getting an A. The probability **that at least one of them** gets an A is **0.70** and **that both** get an A is **0.30**.

[**7**] **(a)** What is the probability that *Linda gets an A*?

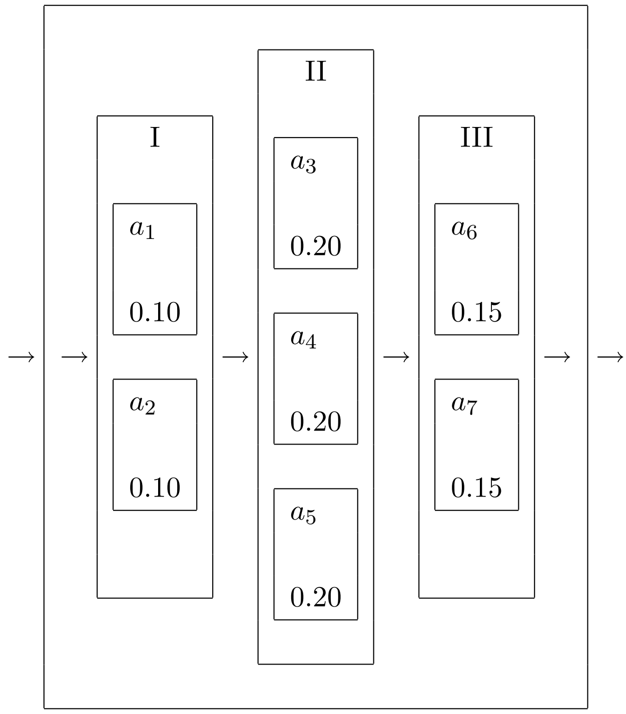
[**9**] **(b)** What is the probability that *John gets an A given that Linda did*?

[**9**] **(c)** What is the probability that *both get an A given that at least one of them did*?

<u>Answer to Problem 1</u>

Answer to Problem 1 (continued)

[**25**] Problem 2: Calculate the reliability of the following system of independent components $\{a_1, a_2, ..., a_7\}$. The numbers in the boxes are the **failure probabilities** for the corresponding components. Components in the subsystems I, II and III are **in parallel** (that is, the subsystem works if any of its components does). The subsystems I, II and III are **in series** (that is, the system works only if all the subsystems do).



Answer to Problem 2

Answer to Problem 2 (continued)

[**25**] <u>Problem 3</u>: A rare but costly flaw affects a fraction **0.005** of the electronic boards built by a company. A test to detect this flaw has probability **0.999** of resulting positive when the flaw is present and probability **0.02** of resulting positive when the flaw is not present.

[**12**] **(a)** What is the probability that the test on a randomly chosen board results positive?

[**13**] **(b)** What is the probability that the flaw is present given that the test resulted negative?

Answer to Problem 3 (continued)

[25] Problem 4: A discrete random variable, X, has the probability mass function given below.

x	-1	0	1	2	3	4	5
$f(x)$	0.10	c_1	0.20	c_2	0.20	0.10	0.05

It is known that

$$\mu_X = E(X) = 1.55$$

[10](**a**) Determine c_1 and c_2.
[10](**b**) Calculate $\sigma_X^2 = Var(X)$.
[5] (**c**) Let $Y = 2X^2 + 3$. Find $\mu_Y = E(Y)$.

Answer to Problem 4

Answer to Problem 4 (continued)