Australian National University

RESEARCH SCHOOL OF FINANCE, ACTUARIAL STUDIES AND APPLIED STATISTICS

INTRODUCTORY MATHEMATICAL STATISTICS (STAT2001)
PRINCIPLES OF MATHEMATICAL STATISTICS (STAT6039)

Mid-Semester Examination – April 2013

Time allowed: *60 minutes*
Reading time: *5 minutes*
Permitted materials: *No restrictions*

Every student should attempt all 5 problems.
Each problem is worth 4 marks. The exam is out of 20 marks.
Please show all working and present each final answer correct to at least 4 significant digits. Draw a box around each final answer.

Problem 1 ***[4 marks]***

Consider two events A and B such that:

$$P(A \mid \bar{B}) = 3/7$$

$$P(A-B) + P(B-A) = 1/2$$

$$P(\bar{A}\bar{B}) / P(AB) = 4 .$$

Find $P(B \mid \bar{A})$.

Problem 2 ***[4 marks]***

You are about to roll six fair dice together a number of times and on each roll observe the six numbers which come up. Find the minimum number of times you will have to roll the six dice if you wish to be at least 99.9999% confident that, on at least one of these rolls of the six dice, the six numbers which come up contain at least five sixes.

Problem 3 ***[4 marks]***

If a single fair die is to be rolled repeatedly, find the probability that the sequence 66 (two sixes in a row) will come up before the sequence 56 (a five followed by a six).

Problem 4 ***[4 marks]***

Consider a discrete random variable Y whose pdf is given by

$$f(y) = \begin{cases} 1/2, & y = 1 \\ 1/4, & y = 2 \\ 1/8, & y = 4 \\ 1/16, & y = 8 \\ \vdots & \end{cases}$$

Calculate $E(\sqrt{Y})$.

Problem 5 ***[4 marks]***

In each of Rooms A, B and C there are 5 men and 9 women, and in Room D there are 8 men and 4 women. A room is chosen randomly from the four rooms, and then three persons are selected randomly from the chosen room (without replacement). We learn that at least one of the three selected persons is a man (i.e. not all of them are women). Find the (single) probability that the chosen room is either Room C or Room D.