Concordia University

Department of Mathematics and Statistics

Course	**Number**	**Section**	
STAT	249/4	All	
Examination	**Date**	**Time**	**Page**
MidTerm	March, 2011	2 Hours	2
Instructor	**Course Examiner**		**Marks**
D. Sen	C. Hyndman		60
Special Instructions:	**Closed Book Exam.** **1. Answer ALL questions.** **2. Full Credit will be given only for answering questions systematically.**		

MARKS

[5+5] Q 1.(a) If events A, B and C are independent, show that A and $B \cup C$ are independent.

(b) Four equally qualified people apply for two identical positions in a company. One and only one applicant is a member of a minority group. the positions are filled by choosing two of the applicants at random. Find the probability that the applicant from the minority group is selected for a position.

[5+5] Q 2. Four married couples are living in a certain suburb. The probability that the husband will vote in a school board election is 0.21, the probability that the wife will vote in the election is 0.28, and the probability that they will both vote is 0.15.

(a) What is the probability that at least one of them will vote?

(b) What is the probability that a husband will vote in the election given that his wife is going to vote?

[4+6] Q 3.(a) If A, B, and C are three equally likely events, what is the smallest value for $P(A)$ such that $P(A \cap B \cap C)$ always exceeds 0.95?

(b) Males and females are observed to react differently to a given set of circumstances. It has been observed that 70% of the females react positively to these circumstances, whereas only 40% of males react positively. A group of 20 people, 15 female and 5 male, was subjected to these circumstances, and the subjects were asked to describe their reactions on a written questionnaire. A response picked at random from the 20 was negative. What is the probability that it was that of a male?

PLEASE TURN OVER

[5+5] Q 4.(a) A multiple-choice test consists of 8 questions, each with three possible answers, only one of which is correct. If a student answers each question by rolling a balanced die and checking the first answer if he gets a 1 or 2, the second answer if he gets a 3 or 4, and the third answer if he gets a 5 or 6, What is the probability that he will get at least seven correct answers?

(b) Ten percent of the engines manufactured on an assembly line are defective. If engines are randomly selected one at a time and tested, what is the probability that the first nondefective engine will be found on the second trial?

[4+6] Q 5.(a) Suppose you are interested in insuring a car video system for $5,000$ against theft. An insurance company charges a premium of 150 for coverage for 1 year, claiming an empirically determined probability of 0.01 that the system will be stolen sometimes during the year. Find the expected value from the insurance company's point of view if you take out this insurance?

(b) A certified public accountant has found that nine of ten company audits contain substantial errors. If the certified public accountant audits a series of company accounts, what is the probability that the first account containing substantial errors will occur on or after the third audited account?

[5+5] Q 6.(a) Five cards are dealt at random and without replacement from a standard deck of 52 cards. What is the probability that the hand contains all 4 aces if it is known that it contains at least 3 aces?

(b) A salesperson has found that the probability of a sale on a single contact is approximately 0.03. If the salesperson contacts 100 prospects, what is the approximate probability of making at least one sale?