Dept of Mathematics and Statistics
King Fahd University of Petroleum & Minerals

STAT301: Introduction to Probability Theory
Dr. Mohammad H. Omar
Major 1 Exam Term 122 FORM A
Tuesday February 26 2013
6.00pm-7.30pm

Name_____ ID#:_____ Serial #:___

Instructions.

1. Please turn off your cell phones and place them under your chair. Any student caught with mobile phones on during the exam will be considered under the **cheating rules** of the University.
2. If you need to leave the room, please do so quietly so not to disturb others taking the test. No two person can leave the room at the same time. No extra time will be provided for the time missed outside the classroom.
3. Only materials provided by the instructor can be present on the table during the exam.
4. Do not spend too much time on any one question. If a question seems too difficult, leave it and go on.
5. Use the blank portions of each page for your work. Extra blank pages can be provided if necessary. If you use an extra page, indicate clearly what problem you are working on.
6. Only answers supported by work will be considered. Unsupported guesses will not be graded.
7. While every attempt is made to avoid defective questions, sometimes they do occur. In the rare event that you believe a question is defective, the instructor cannot give you any guidance beyond these instructions.
8. Mobile calculators, I-pad, or communicable devices are disallowed. Use regular scientific calculators or financial calculators only. Write important steps to arrive at the solution of the following problems.

The test is 90 minutes, GOOD LUCK, and you may begin now!

Question	Total Marks	Marks Obtained	Comments
1	3+2=5		
2	5		
3	4+3+3=10		
4	3+4+3=10		
5	5+3=8		
6	5+3=8		
7	3+3+4=10		
8	4		
Total	60		

Extra blank page

1 (3+2 = 5 points) A box contains 3 marbles: 1 red, 1 green, 1 blue and 1 white. Consider an experiment that consists of taking 1 marble from the box and then replacing it in the box and drawing a second marble from the box.

a) Describe the sample space.

b) Repeat part (a) above when the second marble is drawn *without* replacing the first marble.

2. (5 points) Expand $(x + 2y + 3z)^3$

(Hint: write your final answer fully expanded in the form $a_1 x^n + ... + a_n z^n$)

3. (4+3+3 = 10 points) How many different linear arrangements are there of the letters L, M, N, O, P, Q, R for which

a) L and M are next to each other?

b) L is before M and M is before N?

c) P is not last in line?

4. (3+4+3=10 points) $P(A \cup B) = 0.7, \quad P(A \cup B^c) = 0.9$ and $P(AB^c) = 0.2$.
(i). Find $P(A^c B^c)$

(ii) Find $P(A)$

(iii) Find $P(B^c)$

5. (5+3=8 points) Suppose that each of $M = 5$ men at a party throws his hat into the center of the room and the hats are mixed up. Then each man randomly selects a hat.

   (a) What is the probability that *at least one* of the men selects his own hat?

   (b) What is the probability that *none* of the men selects his own hat?

6. (5+3=8 points) Rajhi Takaful believes that people can be classified into those who are accident prone and those who are not. Company's statistics show that 40% of accident prone person will have an accident within a fixed 1-year period while 20% of not accident prone person is involved in an accident within this period. Past record shows that 15% of the population is accident prone.

   a) What is the probability that a new policyholder will have an accident within a year of purchasing a policy?

   b) If a new policy holder has an accident within a year of purchasing a policy, what is the probability that he is accident prone?

7. (3+3+4=10 points) A simplified model for the movement of the price of a stock supposes that on each day the stock's price either moves up 1 unit with probability p or moves down 1 unit with probability $1 - p$. The changes on different days are assumed to be independent.

a) What is the probability that after 2 days the stock will be at its original price?

b) What is the probability that after 3 days the stock's price will have increased by 1 unit?

c) Given that after 3 days the stock's price has increased by 1 unit, what is the probability that it went up on the first day?

8. (4 points) Prove that if $E_1, E_2, ..., E_n$ are independent events,
   then $P(\ E_1 \cup E_2 \cup ....\cup\ E_n) = 1 - \prod_{i=1}^{n} [1 - P(E_i)]$

END OF TEST PAPER