**King Fahd University of Petroleum & Minerals**

Electrical Engineering Department

EE315: Probabilistic Methods in Electrical Engineering (121)

**Major Exam I**



October 13, 2012

6:00-7:30 PM

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

ID#\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| **Question** | **Mark** |
| 1 | /10 |
| 2 | /10 |
| 3 | /10 |
| Total | /30 |

**Instructions:**

1. This is a closed-books/notes exam.
2. The duration of this exam is one and half hours.
3. Read the questions carefully. Plan which question to start with.
4. CLEARLY LABEL ALL SIGNIFICANT VALUES ON BOTH AXIES OF ANY SKETCH
5. Work in your own.
6. Strictly no mobile phones are allowed.
7. Tables Attached

**Good luck**

|  |  |  |
| --- | --- | --- |
| **Mark at your section** | **Sec** | **Instructor** |
|  | 1 | Dr. Wail **Mousa** |
|  | 2 | Dr. Saad **Al-Ahmadi** |
|  | 3 | Dr. Saad **Al-Abeedi** |

**Problem 1: (10 points)**

**A.** Using axioms of probability, prove that , for any events A and B. (Hint: Use Venn diagram.) (2 points)

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**B.** Consider the experiment of rolling a die 100 times. Find the probability that the number 3 (on the upper face of the die) will appear 10 times. (2 points)

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**C.** Consider the experiment of rolling a die **twice** and let A={the face of the **second** die is 1, 2, or 5}, B={the face of the **second** die is 4, 5, or 6}, and C={the **sum** of the upper faces is 9}. Are the events A, B, and C independent. (3 points)

**Problem 2: (10 points)**

**A.** A manufacturing plant makes radios that each contains an integrated circuit (IC) supplied by three sources A, B and C. The probability that the IC in a radio came from sources A is 0.125 and from source C is 0.375. ICs are known to be defective with probabilities 0.0015, 0.0035, and 0.0025 for sources A, B, and C, respectively. Also, the probability of any given radio will contain a defective IC is 0.003. Obtain the following:

1. The probability that the IC in a radio came from sources B. (2points)
2. If a radio contains a defective IC, then find the probability it came from source B. (2 points)

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**B.** The pdf of random variable is sketched below

2

3

0

 0.45

(a) What is the value of such that ) can be a valid pdf. (2 points)

(b) Find the CDF of , . (2 points)

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C. Determine the distribution function of a random variable that is given as . (2 points)

**Problem 3: (10 points)**

**A.** Assume car arrivals at a gas station that occur at an average of 60 cars/h. The station has only one gas pump. If all cars are assumed to require two minute to obtain fuel,

1. What is the probability of having no car at the pump? (2 points)
2. What is the probability of having a waiting line of three cars (including the car at the pump)? (2 points)

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**B.** The teacher would like to assign a letter grade to his students based on their overall course work mark. Assume that students' marks can be considered as a random variable with Gaussian distribution. With the parameters and The available letter grades and their corresponding marks are given in the table below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Letter Grade | A | B | C | D | F |
| Mark  |  |  |  |  |  |

1. If and 10, find the value of
2. The probability that a student get A in the course. (2 points)
3. The probability that a student will pass the course. (2 points)
4. If and the probability that a student get B is 0.2, what is the probability that a student get A in that course. (2 points)

