KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
DHAHRAN, SAUDI ARABIA

STAT 319: Probability & Statistics for Engineers & Scientists
Semester 163, First Major Exam
Monday July 24, 2017. 7:00 pm

Please circle your instructor's name:

Abbas   Marwan   Riaz   Saleh

Name:_____ ID#:_____

Section#:_____ Class Time: _____ Serial#:_____

Instructions:

1. Formula sheet will be provided to you in exam. You are not allowed to bring, with you, formula sheet or any other printed/written paper.

2. Mobiles are not allowed in exam. If you have your mobile with you, turn it off and put it under your seat so that it is visible to proctor.

3. Show all your work. No points for answer without justification.

4. Round up to 4 decimal points if needed.

5. Make sure you have 6 unique pages of exam paper (including this title page).

Question No	Full Marks	Marks Obtained
1	**14**	
2	**12**	
3	**08**	
4	**12**	
5	**10**	
Total	**54**	

Read all the instructions carefully (mentioned on first page) before starting exam.

Q.No.1: - (5+4+5 = 14 points)

(a) Fourteen microchips are to be placed in a computer. Five of the fourteen chips are randomly selected for inspection before assembly of the computer. Let X denote the number of defective chips among the five chips inspected. Find the probability mass function of X if three of the fourteen microchips were defective.

(b) Suppose that the number of inquiries arriving at a certain interactive system follows a Poisson distribution with an average arrival rate of 12 inquiries per minute. Find the probability of at least 2 inquiries arriving in a 10-second interval.

(c) A recruiting firm finds that 30% of the applicants for a certain industrial job have advanced training in computer programming. Applicants are selected at random from the pool and are interviewed sequentially. Suppose the first applicant with the advanced training is offered the position, and the applicant accepts. If each interview costs $300, find the expected value of the total cost of interviewing incurred before the job is filled.

Q.No.2: - (6+6 = 12 points)

(a) The Luminar Company produces desk lamps. There are three factories (A, B, C) where such desk lamps are manufactured. A Quality Control Manager (QCM) is responsible for investigating the source of found defects. QCM knows that 35% of the total production comes from Factory A and 35% from Factory B. Also, the probabilities of a defective lamp from Factory A, B and C are 0.015, 0.01 and 0.02 respectively. If a randomly selected lamp is not defective, what is the probability that the lamp was not manufactured in factory C?

(b) Of 25 microprocessors available in the supply room, 10 have circuit board for a printer, 5 have circuit board for a modem, and 13 have neither type of board. Find the probability a randomly selected microprocessor

     (i) have both circuit boards.

     (ii) have only one of the two circuit boards.

Q.No.3: - (4+4 = 8 points)

Let X be a continuous random variable with cumulative distribution function given by:

$$F(x) = \begin{cases} 0, & x < 0 \\ c\left(9x - \dfrac{x^3}{3}\right) & 0 \le x < 3 \\ 1 & x \ge 3 \end{cases}$$

(a) Find the value of c.

(b) Find the expected value and variance of X.

Q.No.4: - (6+6 = 12 points)

(a) Two balls are chosen randomly with replacement form a box containing 3 black and 5 white balls. Suppose that you win 50 riyals for each white ball selected and you lose 35 riyals for each black ball selected. Let X denotes your winnings. Find the mean and standard deviation of your winnings.

(b) One engineering firm enjoys 40% success rate in getting state government construction contracts. This month they have submitted bids on eight construction projects to be funded by the state government. The bids for different projects are assessed independently of each other. If you know that the firm will get less than 3 contracts, find the probability that the firm will get more than one contracts.

Q.No.5: - (4+6 = 10 points)

(a) Suppose that the amount of time one spends in a bank is exponentially distributed with mean 10 minutes. What is the probability that a customer will spend more than 15 minutes in the bank given that he is still in the bank after 10 minutes?

(b) Suppose that the lifetime of a component follows a Weibull distribution with $\beta=3$ and $\delta=2000$. Find the lifetime that is exceeded by only 10% components.

With the Best Wishes