UNIVERSITY EXAMINATIONS
EXAMINATION FOR JANUARY /APRIL 2015/2016 FOR BACHELOR OF SCIENCE IN COMPUTER SCIENCE
RCCS 106   PROBABILTY AND STATISTICS

DATE: 14TH APRIL 2016   TIME:11.00A.M -1.00 P.M

GENERAL INSTRUCTIONS:
Students are NOT permitted to write on the examination paper during reading time.
This is a closed book examination. Text book/Reference books/notes are not permitted.

SPECIAL INSTRUCTIONS:
This examination paper consists Questions in Section A followed by section B.
Answer **Question 1 and any Other Two** questions.
QUESTIONS in ALL Sections should be answered in answer booklet(s).

1. **PLEASE start the answer to EACH question on a NEW PAGE.**
2. **Keep your phone(s) switched off at the front of the examination room.**
3. **Keep ALL bags and caps at the front of the examination room and DO NOT refer to ANY unauthorized material before or during the course of the examination.**
4. **ALWAYS show your working.**
5. **Marks indicated in parenthesis i.e. ( ) will be awarded for clear and logical answers.**
6. **Write your REGISTRATION No. clearly on the answer booklet(s).**
7. **For the Questions , write the number of the question on the answer booklet(s) in the order you answered them.**
8. **DO NOT use your PHONE as a CALCULATOR.**
9. **YOU are ONLY ALLOWED to leave the exam room 30minutes to the end of the Exam.**
10. **DO NOT write on the QUESTION PAPER. Use the back of your BOOKLET for any calculations or rough work.**

SECTION A (COMPULSORY)

QUESTION 1 (30 MARKS)

QUESTION 1

a). Define the following terms
   i)   Skewness   **[1 Marks]**
   ii) Kurtosis   **[1 Marks]**
   iii) Mutually exclusive events.   **[1 Marks]**

b). A volunteer ambulance service handles 0 to 5 service calls on any given day. the
    probability distribution for the numbers of service calls is as follows;

Numbers of service calls x	0	1	2	3	4	5
Probability $P(X = x)$	0.10	0.15	0.30	0.20	0.15	0.10

   i). What is the expected number of service calls?   **[2 Marks]**
   ii). Determine the standard deviation of number of service calls.   **[3 Marks]**

c). Given two variables X and Y, by use scatter diagrams differentiate between
    perfect positive and positive correlation.   **[4 Marks]**

d). A bag contains four blue balls and six red balls. Three balls are drawn at random
    without replacement.
   i). Display the given information in a tree diagram.   **[3 Marks]**
   ii). What is the probability that there are exactly two red balls? **[2 Marks]**

e). Suppose that a loss in a certain investment, in thousands of Kenya shillings, is a
    continuous random variable that has the density function of the form

$$f(x) = \begin{cases} k(2x - 3x^2) & -1 < x < 0 \\ 0 & elsewhere \end{cases}$$

   i).   Calculate the value of the constant k.   **[3 Marks]**
   ii). Determine he mean of the random variable X .   **[2 Marks]**
   iii). Find the probability that the loss is at most Kshs. 500.   **[2 Marks]**

f). In a study to determine whether the length of time a person has been employed as a
    system analyst in a company (a proxy for experience X months) is related to how
    much the person is paid (compensation Y dollars), the following data was obtained.
    g).

Employee	A	B	C	D	E	F	G	H	I	J
Compensation Y in Dollars per hour	5	15	18	20	25	25	30	34	38	50
Length of employment X-Months	42	32	37	33	24	29	26	22	24	15

i). Obtain the Rank correlation coefficient. **[4 Marks]**
ii). Is there an association between the rankings? **[1 Marks]**

SECTION B (Answer ANY Two Questions)

QUESTION 2 (20 MARKS)

a). Suppose a poll of 20 voters is taken in a large city. The purpose is to determine X, the number who favour a certain candidate for mayor. Suppose that 60 % of all the city's voters favour the candidate. Find,

i). the probability distribution of X. **[1 Mark]**
ii). the mean of X. **[1 Mark]**
iii). the probability that $X = 2$, and **[2 Mark]**
iv). the probability that $10 \leq X < 13$. **[3 Mark]**

b). The weight of 100 women were measured in kg's as follows:

Weight	No. of Women
40-49	5
50-59	10
60-69	24
70-79	25
80-89	19
90-99	10
100-109	3
110-119	4

(To four decimal places where applicable)
i). Find the median **[4 Marks]**
ii). Find the mode. **[3 Marks]**
iii). Estimate the 74. 1th percentile. **[2 Marks]**
iv). Is the data skewed? Support your answer. **[4 Marks]**

QUESTION 3 (20 MARKS)

a). Two discs are drawn without replacement from a box containing three red and four white discs. If X is the random variable "the number of white discs drawn"; find

i). The probabilities of drawing 0, 1, 2 white discs. **[4 Marks]**
ii). $E(X)$ **[2 Marks]**
iii). $E(X^2)$ **[2 Marks]**
iv). $Var(X)$ **[2 Marks]**
v). $Var(3X - 4)$ **[2 Marks]**

b). A mother monitored the growth of her baby and recorded the length x cm and weight y kg at various stages in the baby development. The results were as follows.

x	12.5	19.5	25	31.4	55.1	68.1	88.5
y	4.43	4.88	6.31	7.18	10.63	13.60	17.95

Required
i). Plot a scatter diagram of y against x and comment on your results. **[2 Marks]**

ii). The product moment correlation coefficient. **[6 Marks]**

QUESTION 4 (20 MARKS)

A random sample of eight drivers insured with a company and having similar auto insurance policies was selected. The following table lists their driving experiences X in years and monthly auto insurance premiums Y in dollars.

Driving Experience (years)	Monthly Auto Insurance Premium
5	$64
2	87
12	50
9	71
15	44
6	56
25	42
16	60

Determine;
i). Dependent and independent variable. **[2 Marks]**
ii). The equation of the regression of Y on X and interpret the coefficients.
[14 Marks]
iii). The value of Y when $X = 12$. **[2 Marks]**
iv). The value of X when $Y = 26$. **[2 Marks]**

QUESTION 5 (20 MARKS)

a). A company produces 1,000 refrigerators a week at three plants. Plant A produces 350 refrigerators a week, plant B produces 250 refrigerators a week and plant C produces 400 refrigerators a week. Production records indicate that 5% of the refrigerators produced at plant A will be defective, 3% of those produced at Plant B will be defective, and 7% of those produced at plant C will be defective. All the refrigerators are shipped to a central warehouse. If a refrigerator at the warehouse is found to be defective, what is the probability that it was produced at plant A?

[5 Marks]

b). The time it takes to deliver perishable goods is normally distributed with mean 12 and variance 144 minutes. If deliveries are made daily, find the probability that it takes
    i). Longer than 7 minutes   **[2 Marks]**
    ii). Less than 10 minutes   **[2 Marks]**
    iii). Between 9 and 13 minutes   **[3 Marks]**

c). A student is likely to wake up on time with probability ¾. If he wakes up on time, there is a probability of 9/10 that he will arrive in the dinning hall in time for breakfast. If he oversleeps, there is a probability of ½ that he will arrive at the dining hall in time for breakfast. If he is late in arriving at the dinning hall, there is a probability of 2/3 that he will miss breakfast, but on any occasion he arrives at the dinning hall on time, he has breakfast.

    i). Summarize the above information using a tree diagram.   **[2Marks]**
    ii). What is the probability that on any one day, he will miss breakfast?
                                                    [2Marks]
    iii). If he misses breakfast, what is the probability that he woke up late?
                                                    [2Marks]
    iv). If the student arrives late for breakfast one day, what is the probability that he woke up late?   **[2Marks]**