RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES, MIHINTALE

B.Sc. (General) Degree in Information and Communication Technology
First Year – Semester II Examination – October/November 2017

ICT 1404 Mathematics and Statistics for Computing

Answer ALL Questions.

Statistical tables and graph papers will be provided. **Time: Three (03) hours.**

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01. (a) The probability distribution of a discrete random variable Y is given by $P(Y=y)=cy^2$,for $y=1,2,3,4$, and 0 elsewhere, where c is a constant. Find the value of c.

[15 marks]

(b) State the conditions fora random variable to follow a binomial distribution. **[20 marks]**

Eight voters are selected randomly .The probability that a person supports for a political party is 0.6, where $X$is the number of voters who support for the political party.

(i) Prove that X follows a binomial distribution. **[20 marks]**
(ii) Find the probability that exactly 3 persons support the political party. **[10 marks]**
(iii) Find the probability that more than 5 persons support the political party. **[10 marks]**

(c) Let X be binomially distributed random variable with n =100 and p=0.1, in the usual notations. Find $P(X \le \mu - 3\sigma)$, where μ and σ are mean and standard deviation. **[25 marks]**

02. The number of houses sold by an estate agent follows a Poisson distribution with a mean of 2 per week.

(a) Find the probability that in the next 4 weeks the estate agent sells:

(i) exactly 3 houses **[15 marks]**
(ii) more than 5 houses. **[15 marks]**

(b) The estate agent will receive a bonus if he sells more than 25 houses in the next 10 weeks.

Use a suitable approximation to estimate the probability that the estate agent receives a bonus.

[20 marks]

Turn Over

03. (a) If $X \sim N(24, 9)$ and $P(X \geq a) = 0.974$, find the value of a. **[20 marks]**

(b) (i) Find the probability of obtaining a sum of seven when two fair dice are tossed. **[20 marks]**

(ii) A pair of fair dice is tossed 100 times and the sum observed on each occasion. Use a suitable approximation to estimate the probability of getting more than 25 seven? **[30 marks]**

(iii) How many tosses would be required in order that the probability of getting at least one seven is 0.9 or more. **[30 marks]**

04. A biologist assumes that there is a linear relationship between the amount of fertilizer supplied to tomato plants and the subsequent yield of tomatoes obtained.
Eight tomato plants of the same variety were selected at random and treated with a solution in which X grams of fertilizer was dissolved in a fixed quantity of water. The yield$Y$ kg of tomatoes was recorded.

	Plant							
Yield (kg)	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**
X	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5
Y	3.9	4.4	5.8	6.6	7.0	7.1	7.3	7.7

(a) Define dependent and independent variables. **[10 marks]**

(b) Plot a scatter diagram in the graph paper provided toyou to illustrate the above information. **[10 marks]**

(c) Calculate the value of the correlation coefficient between X and Y. **[20 marks]**

(d) Calculate the equation of the regression line of Y on X and plot this line on your scatter diagram. **[30 marks]**

(e) Estimate the yield of a plant treated weekly with 3.2 g of fertilizer. **[10 marks]**

(f) Calculate the residuals for the yield when the amount of grams of fertilizer was:

(i) 2.5 **[10 marks]**

(ii) 4.0. **[10 marks]**

05. A house alarm has a sensor on the door (A) and a pressure pad inside the house (B). The logical values of the sensors are:

A = 1 means the door is closed and A = 0 means the door is open.

B = 1 means someone is on the pressure pad and B = 0 means no-one is on the pressure pad.

The alarm sounds when the door is open or if someone is on the pressure pad or both.

(a) Write down the truth table for the alarm. **[15 marks]**

(b) Write down the mini-terms using Boolean algebra for each line of the table, where the output is 1 (Add one more column to the same truth table). **[10 marks]**

(c) Write down a Boolean expression for the behaviour of the alarm. **[10 marks]**

(d) Use your expression to draw a circuit diagram for the alarm system. **[15 marks]**