GENERAL SIR JOHN KOTELAWALA DEFENCE UNIVERSITY
Faculty of Engineering
Department of Mathematics

BSc Engineering Degree
Semester 4 Examination – November 2015
(Intake 31 – ACM/AE/BM/CE/EE/ET/ME/MR/MT)

MA 4051 – APPLIED STATISTICS

Time allowed: 1 hour

19 November, 2015

ADDITIONAL MATERIAL PROVIDED

Standard normal table
Chi-square table

INSTRUCTIONS TO CANDIDATES

This paper contains 3 questions on 5 pages

Answer all questions

This is a closed book examination

This examination accounts for 70% of the module assessment. A total maximum mark obtainable is 100. The marks assigned for each question and parts thereof are indicated in square brackets

If you have any doubt as to the interpretation of the wordings of a question, make your own decision, but clearly state it on the script

Assume reasonable values for any data not given in or provided with the question paper, clearly make such assumptions made in the script

All examinations are conducted under the rules and regulations of the KDU

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$$r=\frac{n\sum(xy)-(\sum x)(\sum y)}{\sqrt{[n\sum(x^2)-(\sum x)^2][n\sum(y^2)-(\sum y)^2]}}$$

$$\hat{y}=bx+a \;;\quad a=\frac{(\sum y)(\sum x^2)-(\sum x)(\sum xy)}{n(\sum x^2)-(\sum x)^2}\;,\; b=\frac{n(\sum xy)-(\sum x)(\sum y)}{n(\sum x^2)-(\sum x)^2}$$

Question 1

(a) Let $X_1, X_2, X_3 \ldots X_n$ be n independent observations of random variable X. Show that sample mean $\overline{X}$ is an unbiased estimator for the population mean μ of X.

[10 marks]

(b) A researcher wishes to estimate the number of days (say X) it takes an automobile dealer to sell a Toyota car. A sample of 50 cars had a mean time on the dealer's lot of 54 days. Assume X has normally distributed with the standard deviation 6 days. Find the 90% confidence interval of the population mean.

[15 marks]

Question 2

(a) Find the following probabilities

(i) $P(Z<2.7)$

(ii) $P(Z<-2.7)$

(iii) $P(-2.7<Z<0.9)$

[3×5=15 marks]

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(b) Following data are obtained in a study on the number of absences and the final grades of seven randomly selected students from a statistics class.

Student	Number of absences x	Final grade y (%)
A	6	82
B	2	86
C	15	43
D	9	74
E	12	58
F	5	90
G	8	78

(i) Find the correlation coefficient r.

(ii) Find the equation of linear regression line.

[2×10=20 marks]

Question 3

(a) An automotive engineer believes that newly designed engine will be a great gas saver. A large number of tests on engines of the old design yielded a mean gasoline consumption of 27.5km per liter, with a standard deviation of 5.2km. Fifty new engines are tested and the mean gasoline consumption is 29.6km per liter. Test the claim of engineer with 0.05 significance level.

[20 marks]

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(b) A sociologist wishes to see whether the number of years of college a person has completed is related to her or his place of residence. A sample of 88 people is selected and classified as shown the following table. At $\alpha = 0.05$, can the sociologist conclude that a person's location is dependent on the number of years of college?

Location	No College	B.S. Degree	Advanced Degree	Total
Urban	15	12	8	35
Suburban	8	15	9	32
Rural	6	8	7	21
Total	29	35	24	88

[20 marks]

End of question paper

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