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ACA-3870 Seat No._____

M. Sc. (Sem. II) Examination

March/April – 2019

Mathematics : Paper - MTHE C-6

(Statistical Methods)

Time : **3** Hours] [Total Marks : **70**

Instructions :

(1) All questions are compulsory.

(2) Follow standard notations and conventions.

(3) Each question carries 14 marks.

1 Attempt any three of the following :

(a) Derive Karl Pearson's Coefficient of correlation formula

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

(b) Find the mean and standard deviation f the first N natural number.

(c) Compute the arithmetic mean of the data in

Marks	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70
No. of student	6	5	8	15	7	6	3

(d) Explain : Types of correlation.

2 Attempt any three of the following :

(a) State and prove Rule for the Inverse Probability.

(b) Consider the experiment of tossing a coin three times :

(i) Develop a tree diagram for the experiment.

(ii) List the experimental outcomes.

(iii) What is the probability for each experimental outcome ?

(c) Prove that If events A and B are independent then the Complementary events $\overline{A}$ and $\overline{B}$ are also independent.

(d) A bag contains 5 white and 3 black balls, another bag contains 4 white and 5 black balls. From any one of these bags a single draw of two balls is made. Find the probability that one of them would be white and the other black ball.

3 Attempt any three of the following :

(a) State the central limit theorem. What is Relationship between the Sample Size and the Sampling Distribution of $\overline{x}$.

(b) Explain Sample Method briefly.

(c) How large a sample should be selected to provide a 95% confidence interval with a margin of error of 10 ? Assume that the population standard deviation is 40.

(d) A population has a mean of 0.1 and standard deviation of 2.1. Find the probability that the mean of random sample of size 900 will be negative.

4 Attempt any three of the following :

(a) Explain : Simple Linear Regression Model and least square method.

(b) Find the equation of regression lines from the following data and also estimate Y for $X = 1$ and X for $Y = 4$:

X	3	2	−1	6	4	−2	5	7
Y	5	13	12	−1	2	20	0	−3

(c) Does a high value of r^2 imply that two variables are causally related ? Explain.

(d) If the two lines of regression are $4x + 5y + 30 = 0$ and $20x - 9y - 107 = 0$ which of these is the line of regression of x and y. Find r_{xy} and σ_y when $\sigma_x = 3$.

5 Attempt any four of the following :

(a) Define : (i) Mean (ii) Standard deviation (iii) Correlation.

(b) Find the equations of regression lines if

$\bar{x} = 7.5,\ \bar{y} = 12.5,\ \sigma_x = 4.5,\ \sigma_y = 9,\ r = 0.9$.

Also find y for $x = 10$.

(c) Two Cards are drawn from a well shuffled pack of 52 cards. Find the probability that both are kings.

(d) Consider a sample with data values of 27, 25, 20, 15, 30, 34, 28 and 25. Compute the range, interquartile range, variance, and standard deviation.

(e) What is the Difference between passion and exponential distribution ?