Register Number:
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ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27
M.Sc. BIG DATA ANALYTICS- II SEMESTER
SEMESTER EXAMINATION – APRIL 2019
BDA 2218: ADVANCED STATISTICAL METHODS
NOTE: Statistical tables will be provided on request

Time: 2½ Hours **Max: 70 Marks**

This question paper has **TWO** printed pages and **ONE** part.

Answer any SEVEN of the following: **7 x 10 = 70**

1. A) Distinguish between Estimate and estimator with example. What are the qualities of a good estimator? Explain

   B) If X ~ B (10, p), Obtain an unbiased estimator of parameter (7+3)

2. A) Throw light on the types of estimates

   B) Describe the role of mean-squared error in estimation theory

   C) Suppose $X \sim U(-\theta, \theta)$. Find MLE of θ (4+3+3)

3. A) Explain terms Size of the test, Power of the test, Type I Error, Type II Error, and Critical Region. Deduce relation between Power and Type II Error

   B) Consider a random sample of size 15 is taken from a normal population, that yielded $S^2_{(n-1)} = 0.695$. Test whether standard deviation is greater than unity by taking the significance level of 0.05 (7+3)

4. A) Define (i) Simple and Composite Hypothesis & (ii) Null and Alternative Hypothesis

   B) Explain main steps involved in testing of hypothesis (4+6)

5. A) Trace metals in drinking water affect the flavour and unusually high concentration can pose a health hazard. Ten pairs of data were taken measuring zinc concentration in bottom water and surface water. Does the data suggest that the true average concentration in bottom water exceeds that of surface water?

		Location									
		1	2	3	4	5	6	7	8	9	10
Zinc concentration in	bottom water	0.43	0.26	0.56	0.53	0.70	0.71	0.65	0.58	0.46	0.72
	surface water	0.41	0.23	0.39	0.41	0.65	0.69	0.63	0.52	0.41	0.61

B) A large automobile manufacturing company is trying to decide to purchase brand A or brand B tyres for its new model. It conducts an experiment using a sample of 14 tyres of each brand. The tyres are used until they wear out. The results are

Brand A	Brand B
$\overline{X}_1 = 37900\,kms$	$\overline{X}_2 = 39800\,kms$
$S_1 = 5400\,kms$	$S_2 = 5900\,kms$

Test the hypothesis at 5% level of significance that there is no deference between the two tyres. Assume that population to be normal distributed with equal variance.

C) A mouth wash distributors states that the average cost of processing the sales order is \$15.25 but the cost controller fears that it is less than \$15.25 and he would like to take some action. If it is so a random sample of 25 orders had a sample mean of \$15.15. Assuming σ= \$0.05. Conduct a test at 1% level of significance to help the cost controller (5+3+2)

6. A) Write a note on Multiple linear Regression

   B) What is the importance of ϵ in regression model?

   C) Differentiate between R^2 and Adjusted R^2 (5+2+3)

7. State and prove Gauss-Markov theorem (10)

8. A) After completing a six month typing course with the Speedy fingers institute, four people, A, B, C & D had their typing speed measured, in words per minute, on each of five kinds of work. The results are given in the table below.

	Legal	Business	Numeric	Prose I	Prose II
A	40	47	42	45	53
B	34	32	14	36	44
C	33	40	31	48	44
D	24	26	25	27	45

   Carryout an Analysis of variance and test, at 5% level of significance, for differences between the people and between kinds of work

   B) Briefly explain about one-way ANOVA (7+3)

9. A) Derive the OLS estimator of Regression Coefficient. Show that it is an Unbiased estimator of Regression Coefficient

   B) Write a note on Logistic regression (7+3)