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**PRESIDENCY UNIVERSITY
BENGALURU
SCHOOL OF COMMERCE**

MID TERM EXAMINATION

Winter Semester: 2021-22

Date: 14/MAY/2022

Course Code: BSE 2011

Time: 10:00 AM – 11:30 AM

Course Name: Applied Statistics

Max Marks: 50

Program & Sem: B.Sc. (Economics) & II Sem

Weightage: 25%

Instructions:

- (i) Read the questions properly and answer accordingly.
 - (ii) Question paper consists of 3 parts.
 - (iii) Scientific and Non-programmable calculators are permitted.
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Part A [Memory Recall Questions]

Answer all the questions. Each question carries TWO marks. (5Qx2M =10M)

1. A random variable $X \sim Bin(10, 0.75)$. Determine $Var(X)$. (C.O.No.1) [Knowledge]

2. A group of five singers is to be selected from a certain university to represent the university in a national level music competition. Which type of sampling technique should ideally be applied here? State with a valid reason. (C.O.No.2) [Knowledge]

3. Identify the population in “a study of the effectiveness of a new production process in reducing the number of defective shoes produced by manufacturing units”. (C.O.No.2) [Knowledge]

4. From a normal population with mean 36 and variance 9, the value of the variable noted was 50. What is the value of the z-statistic? (C.O.No.2) [Knowledge]

5. The following data is thought to have been derived from a sample: 5, 6, 8, 8, 9, 9, 10, 12. Calculate the estimate of mean. (C.O.No.2) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the Questions. Each question carries FIVE mark. (4Qx5M=20M)

6. Out of 800 families with 4 children each, how many families would be expected to have (i) 2 boys and 2 girls (ii) at least one boy. Assume that events of having a boy and a girl to be equally likely. (C.O.No.1) [Comprehension]
7. Suppose that the following data set comes from a standard normal distribution: 0, 1, 1, 2, 2, 3, 5, 8. Find an estimate of the mean and variance by equating the mean and suitable non-central moments. (C.O.No.2) [Comprehension]
8. The random variables X_1, X_2, \dots, X_{50} are independently and identically distributed over with mean 20 and variance 25. Identify the sampling distribution of the sample mean. Hence calculate the probability that the mean of the sample means is at least 21. (C.O.No.2) [Comprehension]
9. Most graduate schools of business require applicants for admission to take the Graduate Management Admission Council's GMAT examination. Scores on the GMAT are roughly normally distributed with a mean of 527 and a standard deviation of 112. (i) What is the probability of an individual scoring above 500 on the GMAT? (ii) How high must an individual score on the GMAT in order to score in the highest 5%? (C.O.No.1) [Comprehension]

Part C [Problem Solving Questions]

Answer all the Questions. Each question carries TEN mark. (2Qx10M=20M)

10. Consider the following statement: "Since accident statistics show that the probability that a person will be involved in a road accident in a given year is 0.02, the probability that he will be involved in 2 accidents in the year is 0.0004". Construct a suitable mathematical model and hence cross-check the validity of the statement with proper reasoning. (C.O.No.1) [Comprehension]
11. The following random sample comes from a continuous uniform distribution on the interval $(0, \theta)$: 0.6, 1.2, 1.5, 3.8. Determine the maximum likelihood estimate of θ . (C.O.No.2) [Comprehension]



Roll No

**PRESIDENCY UNIVERSITY
BENGALURU**

SCHOOL OF COMMERCE

END TERM EXAMINATION

Winter Semester: 2021-22

Course Code: BSE2011

Course Name: Applied Statistics

Program & Sem: B. Sc (Economics) & II Sem

Date: 4th July 2022

Time: 09: 30 AM to 12: 30 PM

Max Marks: 100

Weightage: 50%

Instructions:

- (iv) Read all the questions carefully and answer accordingly.
- (v) Question Paper consists of 3 parts.
- (vi) Scientific and non-programmable calculators are permitted.
- (vii) Statistical tables are to be provided with this Question Paper.

Part A [Memory Recall Questions]

**Answer all the questions. Each question carries TWO marks.
2M = 20M)**

(10Q x

1. A discrete random variable $X \sim Poi(2.5)$. Determine $SD(X)$. (C.O.No.1)
[Knowledge]
2. Calculate $P(\chi_{17}^2 > x) = 0.05$ using χ^2 table. (C.O.No.1)
[Knowledge]
3. State any two advantages of sampling. (C.O.No.2)
[Knowledge]
4. What is the level of significance if the level of confidence is 99%? (C.O.No.2)
[Knowledge]
5. Define alternative hypothesis. (C.O.No.3)
[Knowledge]
6. Define type II error in the context of testing of hypothesis. (C.O.No.3)
[Knowledge]
7. Consider the statement "accept the null hypothesis if the value of the test statistic is less than the critical value". Comment on whether the statement is true or false with valid reasons. (C.O.No.3)
[Knowledge]

8. What is the pivotal quantity for the test of significance of a single mean when a small sample has been drawn from a normal population with unknown population variance?
(C.O.No.4) [Knowledge]
9. Determine the degrees of freedom of the t-distribution that defines the distribution of difference of sample means when the sizes of the samples are 25 and 15 respectively.
(C.O.No.4)
[Knowledge]
10. Which test of significance should be used for validating a hypothesis that considers the sampling distribution of the ratio of sample variances?
(C.O.No.4) [Knowledge]

Part B [Thought Provoking Questions]

Answer all the questions. Each question carries TEN marks. (5Q x 10M = 50M)

11. What probability model is appropriate to describe a situation where 100 misprints are distributed randomly throughout 100 pages of a book? For this model, what are the chances that a page observed at random would contain: (a) at most 3 misprints (b) no misprints at all (c) at least 2 misprints.
(C.O.No.1) [Comprehension]
12. The annual commissions per salesperson employed by a pharmaceutical company averaged Rs. 40,000 with a standard deviation of Rs. 5000.
(a) Represent the income of a salesperson from this company using a suitable statistical model.
(b) What percent of salesperson earn between Rs.32,000 and Rs. 42,000?
(c) What percent of salesperson earn at least 40,000? (C.O.No.1)
[Comprehension]
13. Contents insurance premiums charged by Company A are normally distributed with mean \$740 and standard deviation \$120. Contents insurance premiums charged by Company B are normally distributed with mean \$695 and standard deviation \$60. A random sample of 25 premiums is taken from Company A and a random sample of 12 premiums is taken from Company B. What are the chances that the sample standard deviation of premium of Company A exceeds that of Company B by at least 8.4 times? (C.O.No.2) [Comprehension]
14. Individuals filing for income tax returns prior to 30th June had an average refund of Rs. 1200. Consider the population of 'last minute' filers who file their returns in the last week of June. For a random sample of 400 last filers, the sample mean

refund was Rs. 1054 and sample standard deviation was Rs. 1600. Examine the belief that individuals who wait until the last week get higher refund than early filers.

(C.O.No.3) [Comprehension]

15. The following observations are from a normal population: 5, 6, 7, 5, 6, 7, 1, 15, 20, 30. Assess whether the population variance is 15. (C.O.No.4)

[Comprehension]

Part C [Problem Solving Questions]

Answer both the questions. Each question carries FIFTEEN marks. (2Q x 15M = 30M)

16. The following observations have been collected from a normal population with variance 36:

8.3, 21.87, 9.52, 22.41, 2.47, 10.43, 12.5, 16.75, 21.69, 5.65, 13.54, 4.88, 19.13, 1.01, 19.04, 18.09, 16.42, 14.89, 7.86, 15.22, 5.51, 8.86, 13.65, 15.35, 9.69.

Determine an equal tailed 90% confidence interval for the mean of the population stating any relevant assumptions.

(C.O.No.2) [Comprehension]

17. In a test given to two groups of students the marks obtained are as follows:

| | | | | | | | | | | | | | | | | | | |
|---------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Group A | 1 | 8 | 2 | 0 | 3 | 6 | 5 | 0 | 4 | 9 | 3 | 6 | 3 | 4 | 4 | 9 | 4 | 1 |
| Group B | 2 | 9 | 2 | 8 | 2 | 6 | 3 | 5 | 3 | 0 | 4 | 4 | 4 | 6 | | | | |

Examine the significance of the difference between the average scores of students between

both the groups.

(C.O.No.4)

[Comprehension]