3/73

1905E723

Candidate's Seat No : ________

B.Sc. (Sem.-V) Examination
302 CC Statistics
May-2017

Time : 3 Hours] **[Max. Marks : 70**

Paper-302 (statistical inference & design of experiment)

Instructions: (1) Attempt all questions.

(2) Each carry equal marks.

(3) Numbers on right hand side indicate marks of the question.

Q-1 (a) Describe the problem of interval estimation. [07]

OR

(a) Clear the difference between statistic and estimator. Explain the general problem of estimation.

(b) Obtain 100(1- α)% confidence limits intervals for the parameter Θ and σ^2 of the normal distribution. [07]

OR

(b) Obtain 100(1- α)% confidence limits intervals for the parameter λ of Poisson distribution.

Q-2 (a) State and prove sufficient condition for consistency. [07]

OR

(a) State and prove factorization theorem for discrete case.

(b) A random sample $X_1, X_2, \ldots X_n$ is taken from a uniform distribution with parameter θ. Obtain consistent estimator for θ.

OR

(b) Let X_1, X_2 be a random sample from Poisson distribution with parameter Θ. Then show that $T = X_1 + X_2$ is sufficient statistic.

(P.T.O)

E7 23-2

Q-3 (a) Explain the method of maximum likelihood estimator and state its properties. [07]

OR

(a) State and prove Rao-Blackwell theorem.

Q-3 (b) Let $X_1, X_2, ... X_n$ be a random sample from normal distribution with parameters μ and σ^2. Obtain maximum likelihood estimates of the σ^2 when μ is known/unknown. [07]

OR

(b) A random sample $X_1, X_2, ... X_n$ is taken from a normal population with mean zero and variance σ^2. Obtain MVUE of σ^2.

Q-4 (a) Describe the three principles of experimental design in detail. [07]

OR

(a) Give statistical analysis of two way classified data with one observation per each cell.

(b) For one way classification show that show that $E(s_t^2) > E(s_E^2)$,if null hypothesis is rejected otherwise they are equal. [07]

OR

(b) What is completely randomized design? Describe it in brief. State its merits and demerits.

Q- 5 Answer the following questions: [14]

1) Give an example of a distribution whose M.L.E. is not unbiased.
2) Distinguish between estimator and estimate.
3) Define most efficient estimator.

4) Give an example of a distribution, for which M.L.E. is not unique.
5) What is an unbiased estimator?
6) State the necessary and sufficient condition for obtaining CRLB.
7) Define: Experimental unit.
8) Define: Block
9) State any one application of CRD.
10) State the minimum number of replications required for any design of experiment.
11) Give formulae of critical difference.
12) State any one application of ANOVA.
13) Name the tests that are used in ANOVA technique.
14) Define comparative experiment.

1805E680

Candidate's Seat No :

B.Sc. (Sem.-V) Examination
301 CC Statistics
May-2017

Time : 3 Hours] **[Max. Marks : 70**

Instructions 1. All questions are compulsory and carry equal marks.
2. Statistical tables and graph papers will be provided on request.
3. Use of Scientific calculator is allowed

Q. 1 (a) For Geometric Distribution, derive the cumulative distribution function.

OR

(a) For Negative binomial distribution, show that mean and variance are rq/p *and* rq/p^2 respectively.

(b) Products produced by a machine has a 3% defective rate. What is the probability that (i) first defective occurs in the fifth item inspected, (ii) the first defective occurs in the first five inspections?

OR

(b) State probability mass function of negative binomial distribution. Derive recurrent relation for central moments of negative binomial distribution.

Q. 2 (a) Define term: Truncation. State its different forms. Hence or otherwise, explain, in brief, truncation from right.

OR

(a) Derive Truncated Binomial Distribution, truncated at X = 0. Hence or otherwise its mean and variance.

(b) Derive Truncated Poisson distribution, truncated at X = 0. Obtain its variance.

OR

(b) If X follows normal distribution with mean μ and standard deviation σ, derive the truncated normal distribution from left.

Q. 3 (a) Define power series distribution. Derive poisson distribution and its mean as a special case of power series distribution.

OR

(a) In usual notations, derive the recurrent relation for the raw moments of power series distribution.

(b) For power series distribution, in usual notations, show that

$$\mu_2' = \frac{\theta^2 f''(\theta)}{f(\theta)} + \mu_1'$$

OR

(b) For a log series distribution, obtain first two cumulants using power series distribution.

Q. 4 (a) Obtain the distribution of the smallest and the largest order statistics.

P. T O

E 680-2

OR

(a) If probability distribution function a random variable X is $F(x) = \begin{cases} 0 & ,x > 0 \\ x & ,0 \le x \le 1 \\ 1 & ,x > 1 \end{cases}$,

then obtain the distribution of the largest order statistics and a sample range.

(b) Define order statistics. State use of ordered statistics.

OR

(b) If probability distribution function of a random variable X is

$$f(x) = \begin{cases} e^{-x} & ,x > \infty \\ 0 & ,otherwise \end{cases},$$

obtain the distribution of the smallest order statistics and a sample range.

Q. 5 Answer the following questions, in brief.

(a) State the reason, why negative binomial distribution is known as inverse binomial Distribution?

(b) State the limiting form of negative binomial distribution.

(c) State the moment generating function of geometric distribution and write the first two raw moments of it.

(d) State assumptions while deriving geometric distribution.

(e) State the probability density function of rth order statistics.

(f) Let $Y_1<Y_2<Y_3<Y_4<Y_5$ be the order statistics of 5 independent observations from rectangular distribution R(2,5). Compute the probability that Y_1 is less than 3.

(g) State the role of power series distribution.

———

2205E800

Candidate's Seat No :

B.Sc. (Sem.-V) Examination
304 CC Statistics
May-2017

Time : 3 Hours]

[Max. Marks : 70

Q.1 (a) Define chi-square variate and derive the probability density function of chi-square distribution with n-degrees of freedom.

OR

(a) Derive moment generating function of chi-square distribution and hence find its mean and variance.

(b) Write a short note on 'chi-square probability [illegible]'

OR

(b) If $X_1 \sim \chi^2(n_1)$ and $Y \sim \chi^2(n_2)$, X_1 and Y are independent then obtain the distribution of $\frac{X}{Y}$.

Q.2 (a) Prove that $\frac{r}{\sqrt{1-r^2}}\sqrt{n-2}$ is a t-variate with $(n-2)$ degrees of freedom

OR

(a) Obtain the expression for even ordered central moment for t-distribution with n d.f.

(b) Define student's t distribution and derive its p.d.f.

OR

(b) Discuss two applications of t-distribution with example.

Q.3 (a) Define F-variate and derive the p.d.f. of F-distribution as conceived by Snedecor.

OR

(a) Define Fisher's - Z distribution and obtain m.g.f. of Z distribution.

(b) Derive the mode of F-distribution and comment on it.

(P.T.O)

OR

E 800-2

(b) Derive relation between
  (i) F and χ^2 distribution
  (ii) F and t distribution.

Q.4 (a) Define and explain concept of "Compound distribution".

OR

(a) Derive negative Binomial distribution as compound distribution of Poisson and Gamma distribution.

(b) Write a ~~detailed~~ detailed note on "Compound Binomial distribution".

OR

(b) Let X be a random variate having Poisson distribution with parameter θ and θ follows Gamma distribution. Find unconditional distribution of X. Also find Mean and variance of unconditional distribution of X.

Q.5 Answer the following questions in short
(1) State the situation when Yate's correction is used.
(2) Give two Application of t distribution
(3) If $X \sim F(n_1, n_2)$ then give p.d.f of $Y = \frac{1}{X}$.
(4) Give two Application of F-distribution
(5) State uses of Chi-square statistic.
(6) State two application of Z-distribution
(7) To test the significance difference between two population variance; state the test statistic and test procedure.

——— X ——— X ———

2305E831

Candidate's Seat No

B.Sc. (Sem.-V) Examination
S.E. 305 Statistics A Ecology
May-2017

Time : 3 Hours] **[Max. Marks : 70**

Instructions **1. All questions are compulsory. Total marks: 70**
2. Each question carries equal marks.
3. Statistical tables and graph papers will be provided on request.
4. Use of Scientific calculator is allowed.

Q. 1 (a) What is force mortality? Also, define stable population and stationary population.

OR

(a) Write a note on Leslie Matrix.

(b) With reference to Statistical Ecology, explain in brief: Life table.

OR

(b) Give measures to protect biodiversity.

Q. 2 (a) Explain in detail: Poisson Forest, Regular Spatial Pattern

OR

(a) State probability density function of log normal distribution. How it differs from Normal distribution?

(b) State the probability mass function of Geometric Distribution. State applications of Geometric distribution to ecology.

OR

(b) Write a note on Simpson's index.

Q. 3 (a) Describe capture recapture model in context to Statistical Ecology.

OR

(a) State meaning of different terms used in life table. Give their interrelationship

(b) Explain the procedure of calculating Shannon'sindex.

OR

(b) Explain logistic growth model, in context to ecology

Q. 4 (a) Explain exponential model. Give its applications in ecology.

OR

(a) Define term: Ecology. State different fields where ecology is applied from statistical view point.

(b) Explain Gompertz's model. State its uses.

OR

(b) State properties of exponential model. Also, state it's usefulness in Statistical Ecology.

Q. 5 **ANSWER THE FOLLOWING:**

(a) What is biodiversity?
(b) State two uses of biodiversity in ecology.
(c) Give two names of smoothing process.
(d) What is linear growth model?
(e) Give one limitation, each of exponential and logistics distributions.
(f) State scope Gompertz's model.
(g) What do you call an estimator of population size

---*---*---

2305E832 Candidate's Seat No :________

B.Sc. (Sem.-V) Examination
S.E. 305 B Statistics Using R
May-2017

Time : 3 Hours] **[Max. Marks : 70**

Q-1(a) Explain graphics with R in detail . [7]

OR

(a) Explain R as a statistical software and calculator. [7]

(b) The following table gives the no. of students according to their pocket money . Draw histogram and frequency polygon on the same graph [7]

Pocket Money(in Rs.)	No of students
20-29	10
30-39	24
40-49	18
50-59	12
60-69	8
70-79	5
80-89	3

OR

(b) Prepared a frequency distribution for following data. [7]
62 65 45 58 25 23 65 88 45 47 19 28 29 96 85 96 64 92 34 38 76 98 56 85 65 91 82 72 76 64 42 38 96 85 41 25 23 68 61 54 72 32 75 26 18 29 18 43 18 65 68 96 75 82 43 53 83 92 65 37 39 64

Q-2 (a) Obtain probability distribution of X, where X is number of showing when A six-sided symmetric die is rolled. Simulate random sample of sizes 100, 200 and 500. [7]

OR

(a) A lot of 50 chickens 0f 6 females. If 3 chickens are sleeted at random without replacement, plot the probability distribution and cumulative distribution function of number of female chickens in the sample.

(b) Draw a random samples of sizes 100 and 5000 from binomial distribution with parameters p=0.5 and n=10. [7]

OR

(b) Draw a random samples of sizes 200 from N (5, 2) distribution, also find mean and sd of the sample. [7]

(P.T.O)

E832-2

Q-3 (a) Draw scatter plots of (X1, Y1) and (X2, Y2) for the following data. [7]

Y1	X1	Y2	X2
8.04	10	9.14	10
6.95	8	8.14	8
7.58	13	8.74	13
8.81	9	8.77	9
8.33	11	9.26	11
9.96	14	8.10	14
7.24	6	6.13	6

OR

(a)Obtain least squares equation of line of regression of X on Y for the following table. The maximum score in each test was 50. [7]

Scores in Botany	34	37	32	35	36	37	39	35	37	32
Scores in Zoology	34	35	40	42	36	38	39	33	32	39

(b)Compute Pearson's and Spearman's correlation coefficient for the following data: [7]

X	5.12	6.18	6.77	6.65	6.36	5.90	5.48	6.02	10.34	8.51
Y	2.30	2.54	2.95	3.77	4.18	5.31	5.53	8.83	9.48	14.20

OR

(b) The following data pertain to the resistance(x) in (ohms) and the failure times(y) (minutes) of 24 overloaded resistors. Obtain a line of regression of y on x and draw a scatter plot. [7]

x	43 36	29 39	44 36	33 28	47 40	34 42	31 33	48 46	34 28	46 48	37 35
y	32 36	20 33	45 21	35 44	22 26	46 45	28 39	26 25	37 36	33 22	46 45

Q-4 (a)Fit Binomial distribution and test goodness of fit for the following data:[7]

X	0	1	2	3	4
f	5	20	45	20	10

E832-3

OR

(a)Fit Poisson distribution and test goodness of fit for the following data:[7]

X	0	1	2	3	4 or more
f	6	8	12	4	3

(a) Simulate one random sample each from normal (1,1) and exp(1) distribution. Draw box plots and qq normal plots to judge whether the parent population are normal. [7]

OR

(b) Suppose three drying formulas for curing a glue are studied and the following drying times are observed. [7]

Sr. No	Formula	Observations
1	A	11,13,10,8,8
2	B	14,13,11,14
3	C	3,1,4,2,4,4

Carry out Analysis of Variance using R – commands.

Q-5 Answer the following: [14]

(1)Explain matrix function with example.
(2)Give name of any two in-built function with example.
(3)Explain c function with example.
(4)How to use data.frame function in R?
(5)Give any two uses of R- software.
(6)If X~N(0,1) find the P(X>2) using R function.
(7)If X~P(2.5) find the P(X>8) using R function.

2005E769

Candidate's Seat No :

B.Sc. (Sem.-V) Examination
303 CC Statistics
May-2017

Time : 3 Hours] **[Max. Marks : 70**

Instruction: Attempt all questions.

Q.1(a) What are the methods for selecting a random sample? Explain any one.

OR

(a) Show that in simple random sampling, wor, the sample mean $\bar{y}$ is an unbiased estimator of population mean $\bar{Y}$ and its sampling variance is given by

$$V(\bar{y}) = (1-n/N)S^2/n \quad \text{where } S^2 = N\sigma^2/(N-1).$$

(b)Discuss confidence limits for population mean and total.

OR

(b) Suggest an unbiased estimator of population proportion in simple random sampling without replacement and derive its variance. Also, obtain unbiased estimator of this variance.

Q.2 (a)What do you mean by strata? Explain principles of stratification.

OR

(a) Show in usual notations, if f.p.c. is ignored then

$$V_{opt} \leq V_{prop} \leq V_{SR}.$$

(b)Suggest an unbiased estimator of population mean in stratified random sampling without replacement and derive its variance. Also, obtain unbiased estimator of this variance.

OR

(b)For optimum allocation when sample size n is fixed, derive the formula for variance for proportion case in stratified sampling.

Q.3(a) Discuss the situations under which systematic samples are preferred to other types of samples in censuses and surveys.

OR

(a) Give comparison of systematic sampling with stratified sampling.

(b) In a finite population of size N, show that systematic sampling will be more efficient than random sampling with equal probability, wor, if the intra-class correlation coefficient $\rho < -1/(N-1)$.

OR

(b)Obtain an unbiased estimator of population mean in systematic sampling and derive its sampling variance.

P.T.O.

Q.4 (a) Define two stage sampling. Also describe a situation where it can be used.

OR

(a) In usual notations obtain m_{opt} and n_{opt} in two stage sampling.

(b) Suggest an unbiased estimator of population total in two- stage sampling. Obtain its variance using SRSWR at both the stages. Also, obtain an unbiased estimator of this variance.

OR

(b) Suggest an unbiased estimator of population total in two- stage sampling. Obtain its variance using SRSWOR at both the stages. Also, obtain an unbiased estimator of this variance.

Q.5 Answer the following:

(i) Define standard error and relative standard error.

(ii) Define f.p.c. and sampling fraction.

(iii) What do you understand by estimation of sample size?

(iv) Define stratified sampling.

(v) What do you mean by equal allocation?

(vi) Discuss advantages of systematic sampling.

(vii) Discuss advantages of two stage sampling.

***