



UNIVERSITY OF THE PUNJAB

B.A. / B.Sc. Part-II
Annual Exam - 2017

Roll No.

Subject: Statistics-II
PAPER: A

TIME ALLOWED: 3 hrs.
MAX. MARKS: 75

Note: Attempt FIVE questions in all, at least TWO questions from each section.

SECTION-1

Q.1 a) Discuss the importance advantages of sampling over complete enumeration. (6 + 9)

b) A and B manufacture two types of cables, having mean breaking strengths of 4000 and 4500 pounds and standard deviation of 300 and 200 pounds respectively. If 100 cables of brand A and 50 cables of brand B are tested, What is the probability that the mean breaking strengths of B will be

(a) at most 600 pounds more than A (b) at least 450 pounds more than A

Q.2 a) What is meant by a sampling distribution and sampling distribution of proportions?

Explain the properties of sampling distribution of proportions.

(6 + 6 + 3)

b) Suppose a population of $N = 9$ is stratified into 3 strata with the following measurement:-

Stratum I	Stratum II	Stratum III
$X_{11} = 1$	$X_{21} = 6$	$X_{31} = 9$
$X_{12} = 2$	$X_{22} = 8$	$X_{32} = 10$
$X_{13} = 4$		$X_{33} = 12$
		$X_{34} = 14$

If two measurements are drawn from each stratum for the sample without replacement, List these sample and compute the mean for each sample.

c) If the population size $N = 10$ with mean and variance of 4 and 5 respectively. Find the mean and standard deviation for the sampling distribution of means for a sample of size 4 selected at random without replacement. Between what two values would you expect at least $\frac{3}{4}$ of the sample means to fall?

Q.3 a) Define Estimation, estimate and estimator.

(3 + 6 + 6)

b) Based on a random sample of 2 observations, consider two estimator of μ .

$$\bar{X}_1 = \frac{1}{2} X_1 + \frac{1}{2} X_2 \quad \text{and} \quad \bar{X}_2 = \frac{1}{3} X_1 + \frac{2}{3} X_2$$

i) Are they unbiased? ii) What is the efficiency of \bar{X}_2 relative to \bar{X}_1 .

c) The following summary statistics are recorded for independent random samples from two population:

Sample I	$n_1 = 9$	$\bar{X}_1 = 16.18$	$\hat{S}_1 = 1.54$
Sample II	$n_2 = 6$	$\bar{X}_2 = 14.22$	$\hat{S}_2 = 1.37$

Assume that populations are normal with the identical standard deviations.

Compute a 95% confidence interval for the difference between the population means.

Q.4 a) Define the following concepts:

(6 + 9)

i) Statistical Hypotheses ii) Critical region iii) Level of significance

b) The HRD manager wishes to see if there has been any change in the ability of trainees after a specific training programme. The trainees take an aptitude test before the start of programme and an equivalent one after they have completed it. The scores recorded are given below.

Has any change taken place at 5 percent significance level?

Trainee	A	B	C	D	E	F	G	H	I
Score before training	75	70	46	68	68	43	55	68	77
Score after training	70	77	57	60	79	64	55	77	76

Q.5 a) Define Chi-square distribution and Write any three properties of its.

(5 + 5 + 5)

b) A random sample of 21 sophomores who stayed home and commuted to their schools had a mean GPA of 2.685 with unbiased standard deviation of 0.792. A random sample of 21 sophomores who went away to schools had a mean GPA of 2.480 and with unbiased standard deviation of 0.689. At the 0.05 level, are the population variances for the two groups equal?

c) A random sample of 8 units from a normal population gives an unbiased estimate of population variance as 4.4. Find the 90 percent confidence limits for population standard deviation σ .

P.T.O

SECTION-II

- Q.6 a) Suppose that six coins are tossed simultaneously 640 times and the following frequency distribution is observed:

(9 + 6)

Number of heads	0	1	2	3	4	5	6
Observed frequency	13	70	137	210	145	56	9

Test the null hypothesis that the coins are well balanced with $\alpha = 0.01$.

- b) A machine is supposed to mix peanuts, hazelnuts, cashews, and pecans in the ratio 5 : 2 : 2 : 1. A containing 500 of these nuts was found to have 269 peanuts, 112 hazelnuts, 74 cashews, and 45 pecans. At the 0.05 level of significance, Test the hypothesis that the machine is mixing the nuts in the supposed ratio.

- Q.7. a) Differentiate between mean prediction and individual prediction of given value X_0 . (3 + 12)

- b) In a chemical process the temperature is fixed at various levels and the yield of process found at each of the temperatures. The data are given in the following table,

Temperature: $X(^{\circ}\text{C})$	50	60	70	80	90
Yield: Y	2	2	4	3	5

The random error has standard deviation ($S_{y,x}$) 0.5. Do the data indicate that the response is linear. Use $\alpha = 0.01$. Also find the 95% confidence interval for β .

- Q.8. a) What is Partial and Multiple Correlation.

(3 + 9 + 3)

- b) We are given the following calculations:

$$\bar{X}_1 = 8, \bar{X}_2 = 7, \bar{X}_3 = 50, S_1^2 = 15, S_2^2 = 23.33, S_3^2 = 668$$

$$r_{12} = -0.891, r_{13} = -0.969, r_{23} = 0.961, n = 6$$

- i) Compute $r_{12.3}$ and test its significance.
ii) Compute $R_{3.12}$ and test its significance.

- c) If $R_{1.23} = 1$, then prove that $R_{2.13} = 1$

- Q.9 a) What is meant by analysis of variance? Partition the total variation in two way classification.

(5 + 10)

- b) The following data represent the final grade obtained by four students in mathematics, statistics and economics. Use a 0.05 level of significance to test the hypothesis that:
i) The courses are of equal difficulty. ii) The students have equal ability
iii) If the null hypothesis are rejected in any one cases, determine which means are significantly different (LSD).

Students	Mathematics	Statistics	Economics
1	84	92	94
2	75	77	67
3	79	86	78
4	78	77	73

- Q.10 a) What is meant by completely randomized design and What are its advantages and Disadvantages.

(4 + 11)

- b) The letter A, B, C and D represents 4 varieties of wheat, the rows represent 4 different fertilizers, and the columns account for 4 different years. The data in table are yields for the four varieties of wheat measured in kilograms per plot. It is assumed that the various sources of variation do not interact. Using a 0.05 level of significance, test the hypothesis that

- i) H_0' : There is no difference in the average yields of wheat when different kinds of fertilizer are used;
ii) H_0'' : There is no difference in the average yield of the four varieties of wheat.

Fertilizer Treatment	Year			
	1978	1979	1980	1981
t_1	A 70	B 75	C 68	D 81
t_2	D 66	A 59	B 55	C 63
t_3	C 59	D 66	A 39	B 42
t_4	B 41	C 57	D 39	A 55



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B.A. / B.Sc. Part-II
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Subject: Statistics
PAPER: Optional

TIME ALLOWED: 3 hrs.
MAX. MARKS: 100

Note: Attempt any FOUR (4) questions. All questions carry equal marks.

1.(a) Explain the difference between the descriptive and inferential statistics: (6)

(b) Draw a histogram illustrating the following data: (19)

Age nearest birthday:	20-29	30-39	40-49	50-59	60-69	70-79	80-89
No. of men:	1	2	26	22	20	15	14

Q.2 (a) Define median, mode. (6)

(b) Find mean, median and mode of the following distribution showing marks obtained by students at a certain exam. (19)

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	3	12	20	30	21	9

3-(a) Define quartile deviation. (6)

(b) Find the co-efficient of variation from the following frequency distribution. : (19)

Marks	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Frequency	2	3	11	20	32	25	7

4 (a) Define the Co-efficient of variation. (6)

(b) Compute Co-efficient of skewness by Bowly's formula. (19)

Marks	10-14	15-19	20-24	25-29	30-34	35-39	40-44
Frequency	2	4	6	9	12	4	1

5-(a) Explain what is meant by Regression, Regressor and Regressand (6)

(b) Compute the least squares regression equation of Y on X for the following data: (19)

X	6	5	8	8	7	6	10	4	9	5
Y	8	7	7	9	5	8	10	6	8	6

6-(a) Differentiate between regression and correlation. (6)

(b) Calculate the co-efficient of correlation of the following data: (19)

Price (x)	2	3	4	5	6	7	8	9
Demand (Y)	24	23	20	18	17	14	10	5

7-(a) Explain the following terms Variable and Attribute. (6)

(b) Given the following contingency table for hair colour and eye colour, (19)

Test the null hypothesis of independence of the two classification at the 0.01 level of significance.

Eye Colour	Hair Colour		
	Fair	Grey	Brown
Blue	79	49	26
Black	81	56	28
Dark blue	67	34	30

8-(a) Define the following terms: Population, Sample and Sampling. (6)

(b) A Population consists 4,5,6,7,8,9. Calculate the sample means for all possible random samples of size = 2, that can be drawn from this population, without replacement. Find sample mean from each sample and make a sampling distribution of \bar{X} . Calculate mean and standard deviation of this sampling distribution of \bar{X} and verify that (19)

$$\mu_{\bar{X}} = \mu \quad \text{and} \quad \sigma_{\bar{X}} = \frac{\sigma}{\sqrt{n}} \cdot \sqrt{\frac{N-n}{N-1}}$$