Roll No. _____ [Total No. of Pages : 2

PG2S-071-B-22

M.Sc. II Semester (CBCS) Degree Examination

STATISTICS

Distribution Theory

Paper : HCT - 2.1

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer any Six questions from Part -A and Five questions from Part - B.

PART - A

(6×5=30)

1. Define Poisson distribution. Show that for a Poisson distribution, the coefficient of variation is the reciprocal of the standard deviation.

2. Find the factorial moments of hypergeometric distribution.

3. Define Chi-square distribution. Mention its properties.

4. Explain memory less property. Prove that exponential distribution has this property.

5. What is meant by mixture of binomial distribution? Obtain the Poisson mixture of binomial distribution.

6. Define order statistics. State its uses.

7. If X_1 and X_2 are independently distributed as chi-square variables with 2 degrees of freedom, find the density function of $Y = \frac{1}{2}(X_1 - X_2)$.

8. Let X_1, X_2 be independent random variables having the density law $f(x) = e^{-x}$, $x > 0$. Show that $Z = \frac{x_1}{x_2}$ has an F-distribution.

PART - B

(5×10=50)

9. If X has absolutely continuous distribution F, then show that -2log F(x) is exponential.

10. Let X and Y be independent random variables from N $(0, \sigma^2)$. Find the distribution of $\frac{X}{Y}$.

11. If the r.v's X_1, X_2, X_3 are iid random variables with density function $f(x) = e^{-x}$, $x > 0$, show that $(X_1 + X_2 + X_3)$, $\frac{X_1+X_2}{X_1+X_2+X_3}$, $\frac{X_1}{X_1+X_2}$ are independent.

12. If X and Y are independent Gamma variables with parameter μ and γ respectively, find the distribution of $\frac{X}{X+Y}$ and hence obtain $E\left(\frac{X}{X+Y}\right)$.

13. If the r.v X has a standard Cauchy distribution, find the p.d.f of X^2.

14. Prove that (X, Y) possess a bivariate normal distribution if and only if $aX+bY$, $a\neq0$, $b\neq0$ is a normal variate.

15. Define F statistic. Derive its distribution.

16. Obtain the distribution of the sample range r in a sample of size 4 from the rectangular population having pdf $f(x)=1/\theta$, $0 \leq x \leq \theta$. Also find E(r) and var(r).

Roll No. _____ [Total No. of Pages : 2

PG2S-079-B-22

M.A./M.Sc. II Semester (CBCS) Degree Examination

STATISTICS

Practical Based on OET 2.1

Paper : OEP - 2.1

Time : 2 Hours **Maximum Marks : 30**

Instructions to Candidates:

1) ***Answer any TWO questions.***
2) ***All questions carry equal marks.***

1. a) For the following distribution of wages, draw histogram, frequency polygon and frequency curve on the same graph sheet.

Monthly wages	Frequency	Monthly wages	Frequency
12.5-17.5	5	37.5-42.5	4
17.5-22.5	22	42.5-47.5	6
22.5-27.5	10	47.5-52.5	1
27.5-32.5	14	52.5-57.5	1
32.5-37.5	3	Total	66

b) The numbers 3.2, 5.8, 7.9 and 4.5 have frequencies x,(x+2), (x-3) and (x+6) respectively. If the arithmetic mean is 4.876, find the value of x. **(10+5)**

2. a) The following table was formed using the marks obtained by some students in an examination.

Marks	No. of students
0-10	10
10-20	29
20-30	52
30-40	9

Compute moment coefficient of skewness and decide the nature of the distribution.

b) The means, variances and sizes of two sets of data given below:

Mean	Variance	Size
2	2/3	3
3	2/3	3

Obtain the standard deviation of the combined series. **(10+5)**

3. The ages of twenty husbands and wives are given below. Form a two-way frequency table with class intervals 20-25, 25-30, etc. Calculate the individual standard deviation after the classification.

Sl.No.	Age of Husband	Age of Wife	Sl.No.	Age of Husband	Age of Wife
01	28	23	11	27	24
02	37	30	12	39	34
03	42	40	13	23	20
04	25	26	14	33	31
05	29	25	15	36	29
06	47	41	16	32	35
07	37	35	17	22	23
08	35	25	18	29	27
09	23	21	19	38	34
10	41	38	20	48	47

(15)

4. a) The age in years of couples is given below. Compute the coefficient of correlation and interpret it.

X	21	25	26	24	22	30	19	24	28
Y	19	20	24	21	24	18	20	19	30

b) The following table shows the systolic blood pressures of each of 5 pairs of identical twins. Compute the coefficient of correction and interpret it. Estimate Y when X=115 and X when Y=117.

First twin (x)	Second twin (y)
118	115
116	119
118	116
120	119
122	118

(5+10)

Roll No. _____ [Total No. of Pages : 2

PG2S-073-B-22

M.A./M.Sc. II Semester (CBCS) Degree Examination

STATISTICS

Testing of Hypotheses

Paper : HCT- 2.2

Time : 3 Hours **Maximum Marks :80**

Instructions to Candidates:

Answer any SIX questions from Part- A and **FIVE** questions Part-B.

PART-A

(6×5=30)

1. Define

a) Level of significance

b) Level of test

c) Class of level α test

2. Let $X \sim P(\lambda)$. Obtain a most powerful test of size α for testing $H_0 : \lambda = \lambda_0 \ v/s \ H_1 : \lambda = \lambda_1 (\lambda_1 > \lambda_0)$.

3. Define MLR property. Check whether B(1,P) has MLR property.

4. Write a UMPU at level α test for testing.

i) $H_0 : \theta \leq \theta_0 \ v/s \ H_0 : \theta > \theta_0$

ii) $H_0 : \theta \leq \theta_1 \ or \ H_0 : \theta_1 \geq \theta_2 \ v/s \ H_1 : \theta_1 < \theta < \theta_2$

5. Obtain approximate expression for OC function of Wald's SPRT.

6. State the properties of LR test.

7. Describe the procedure of

   a) Single sample sign test.

   b) Paired-sample sign test.

8. Write a note on Chi-square test of goodness of fit.

PART- B

Answer any Five of the following. **(5×10=50)**

9. State and prove Neyman-pearson lemma.

10. Let $X_1, X_2, X_3, \ldots\ldots, X_m$ and $Y_1, Y_2, Y_3, \ldots\ldots Y_n$ be two independent random samples from $N(\mu, \sigma^2)$ respectively. Derive LRT for testing $H_0 : \mu_1 = \mu_2$ aganist $H_0 : \mu_1 \neq \mu_2$ when σ^2 is known.

11. Define MP test and UMP test. Show that if Φ be the most powerful test at level $\alpha (0 < \alpha < 1)$ for testing H_0 v/s H_1, where H_0 and H_1 are simple hypothses, then the power of $\Phi \geq$ size of Φ or power of MP test is $\geq$ its size.

12. Show that Wald's SPRT terminates with probability 1.

13. Test for the independence in bivariate normal distribution.

14. Describe the procedure of run test to test randomness of sample. Derive the null distribution of the statistic based on runs.

15. Let $X \sim N(\mu, \sigma^2)$. Obtain the LRT for testing $H_0 : \sigma^2 = \sigma_0^2$ v/s $H_1 : \sigma^2 \neq \sigma_0^2$, where μ is unknown.

16. Discuss the execution of Mann-Whitney U-test. Obtain the mean and variance under the null hypothesis.

Roll No. _____ [Total No. of Pages : 2

PG2S-077-B-22

MA./M.Sc. II Semester (CBCS) Degree Examination

STATISTICS

Basic Statistics

Paper : OET - 2.1

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer any Six questions from Part - A and Five questions from Part - B.

PART - A

(6×5=30)

1. Define Classification. Explain its types.
2. Outline the preparation of a bivariate frequency table.
3. What are the advantages of diagrammatic representation of statistical data over tabulation?
4. Define average. What are the essentials of a good average?
5. Define quartiles, deciles and percentiles.
6. Calculate Karl Pearson's coefficient of skewness from the following data.

Value	6	12	18	24	30	36	42	48
Frequency	5	7	9	18	12	10	8	5

7. Define coefficient of variation (C.V.). What are its applications?
8. Define correlation. Discuss its types.

PART - B

(5×10=50)

9. a) The monthly profits in rupees of 100 shops are distributed as follows:

Profits per shop	No. of shops
0-100	12
100-200	18
200-300	27
300-400	20
400-500	17
500-600	6
600-700	3

Draw a histogram of the data and find the modal value. Check this value by direct calculation.

b) Tabulate the following about the coffee drinking habits of males and females in two towns A and B:

There are 55% males, 28% coffee drinkers and 18% male coffee drinkers in town A. Also there are 52% males, 25% coffee drinkers and 16% male coffee drinkers in town B.

(5+5)

10. a) Write a note on Tabulation.

b) The marks in Statistics obtained by the students of a class are given below. Compute the 80^{th} percentile.

Marks	No. of students
0-20	15
20- 40	20
40-60	30
60-80	20
80-100	15

(5+5)

11. a) Discuss the properties of arithmetic mean.

b) The mean wage of 100 labourers working in a factory, running two shifts of 60 and 40 workers respectively, is Rs.38. The mean wage of 60 labourers working in the morning shift is Rs. 40. Find the mean wage of 40 labourers working in the evening shift. **(5+5)**

12. a) Write a note on Scattered diagram.

b) Find coefficient of variation for the squares of first '5' natural numbers. **(5+5)**

13. a) Define mean deviation. Discuss its properties.

b) Find mean deviation about median for the following data.

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
No.of students	3	8	17	20	25

(5+5)

14. Given the bivariate data:

X	1	5	3	2	1	1	7	3
Y	6	1	0	0	1	2	1	5

i) Fit a regression line of Y on X and hence predict Y if X 5.

ii) Fit a regression line of X on Y and hence predict X if Y = 2.

iii) Calculate Karl Pearson's correlation coefficient. **(10)**

15. From the prices of shares X andY given below, state which share is more stable in value:

X	55	54	52	53	56	58	52	50	51	49
Y	108	107	105	105	106	107	104	103	104	101

(10)

16. Write short notes on any Two of the following:

i) Frequency Polygon

ii) Variables and Attributes

iii) Quartile deviation

iv) Pie chart **(5+5)**