Roll No _____ [Total No. of Pages : 2

PG2S-308-B-23
M.A./M.Sc II Semester Degree Examination
STATISTICS
Testing of Hypotheses
Paper : HCT-2.2

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

Instruction to Candidates:

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

PART - A

1. Define **(6×5=30)**

a) Power of a test

b) Most powerful test

c) Unbiased test

2. Let $X_1, X_2, ..., X_n$ be a random sample from N $(\mu, \sigma 0^2)$ distribution. Find MP test of size α for testing $H_0 : \mu = \mu_0 v / s H_1 : \mu = \mu_1 (\mu_1 > \mu_0)$

3. Define MLR Property, Examine whether U$(0, \theta)$ has MLR Property.

4. Obtain a UMP level α test for testing $H_0 : \theta \leq \theta_0 v / s H_1 : \theta > \theta_0$ based on a random sample from B (N, θ) distribution.

5. Describe Wald's SPRT of strength (α, β) for testing $H_0 : \lambda = \lambda_0 v / s H_1 : \lambda = \lambda_1 (\lambda_1 > \lambda_0)$ in P(λ).

6. Obtain expression for ASN function of Wald's SPRT.

7. If both LRT and MP test exist, then prove that they are equivalent.

8. Outline the merits and demerits of non-parametric test.

PART - B

9. Let Let $X_1, X_2, ..., X_n$ be a random sample from G $(1, 1/\theta)$. Obtain a MP test of size α for testing $H_0 : \theta = \theta_0 v / s H_1 : \theta = \theta_1 (\theta_1 > \theta_0)$. **(5×10=50)**

10. Suppose that the function $\{f_\theta(x) : \theta \in \Theta\}$ possesses MLR Property in T(x). Prove the following.

i) The power function $B_\phi(\theta)$ is strictly increasing in θ, for $0 < B_\phi(\theta) < 1$.

ii) The test function ϕ is UMP at level α for testing $H_0 : \theta \leq \theta_0 v / s H_1 : \theta > \theta_0$

Where ϕ is given by

$$\Phi(X)=\begin{cases}1 \text{ if } T(x)>k\\ r \text{ if } T(x)=k\\ 0 \text{ if } T(x)<k,\end{cases}$$

and k and r are constants, found such that $E_{\theta_0}\varphi(x)=\alpha$.

11. Let $X_1,X_2,....,X_n$ be a random sample from N (μ,σ^2) distribution. Find a UMPU test of α size α for testing $H_0:\mu=\mu_0$ v/s $H_1:\mu\neq\mu_0$.

12. Obtain stopping bonds A and B of SPRT in terms of strength (α,β).

13. Find OC and ASN function of Wald's SPRT in case of N (μ,σ_o^2) and also test $H_0:\mu=\mu_0$ v/s $H_1:\mu=\mu_1(>\mu_0)$ based on a random sample from this distribution.

14. Outline the LRT test for comparison of means of two independent normal populations.

15. Show that under regularity conditions, under H_0, $-2\log\lambda_n \sim \chi_1^2$, where λ_n is the LR statistic for testing $H_0:\theta=\theta_0$ v/s $H_1:\theta\neq\theta_0$.

16. What are non-parametric tests? Outline Kolmogorov-Smirnov one sample test.

Roll No _____ 106593 [Total No. of Pages : 2

PG2S-310-B-23

M.A./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

1. Define **(6×5=30)**

a) Discrete and continuous variable

b) Relative frequency and cumulative frequency.

2. Discuss the importance and limitations of graphical and diagrammatic presentation of data.

3. Outline the construction of histogram.

4. Define Arithmetic mean. State its properties.

5. What is dispersion? Discuss the absolute and relative measures of dispersion.

6. What is skewness? Explain its types?

7. Define

i) Quartiles ii) Deciles iii) Percentiles

8. Obtain the line of regression of Y on X using least squares method.

PART - B

(5×10=50)

9. Draw less than and more than ogives to the following frequency distribution and hence, locate the value of median. **(5+5)**

Size	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11
Frequency	3	7	9	15	25	20	14	12	8	6	2

10. a) Explain grouping method of computation of mode.

b) The following frequency table relating to the marks scored by students in an examination.

Marks	40-50	50-60	60-70	70-80	80-90	90-100
No. of Students	9	23	45	14	5	4

Calculate median and modal marks of the students.

11. a) Define standard deviation. Discuss its properties. (5+5)

b) The following table gives the result of two centers of a public examination.

Centre	No.of examinees	Mean score	Standard deviation
A	200	25	3
B	250	10	4

Calculate the standard deviation of the combined scores of the two centers.

12. a) Define coefficient of variation. What are its applications? (5+5)

b) The respiratory rate per minute of 10 individuals are given below:

23, 22, 20, 24, 16, 17, 18, 19, 21, 25

Find mean and coefficient of variation.

13. a) Define kurtosis. Mention its types. How kurtosis is measured by moments? (3+3+4)

b) Karl Pearson's coefficient of skewness of a distribution is 0.32, its standard deviation is 6.5 and mean is 29.6. Find the mode of the distribution.

c) In a frequency distribution, the coefficient of skewness based upon the quartiles is 0.6. If the sum of the upper and lower quartiles is 100 and median is 38, find the value of upper and lower quartiles.

14. a) Discuss the properties of regression coefficients. (5+5)

b) The following are the marks of 8 students in Statistics and Mathematics. Calculate the rank correlation coefficient.

Marks in Statistics	25	43	27	35	54	61	37	45
Marks in Mathematics	35	47	20	37	63	54	28	40

15. Obtain the equations of two lines of regression for the following data: (5+5)

X	1	2	3	4	5	6	7	8	9
Y	9	8	10	12	11	13	14	16	15

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

a) Classification of data

b) Bivariate frequency table

c) Pie chart

d) Bowley's coefficient of skewness

Roll No _____ [Total No. of Pages : 2

PG2S-312-B-23

M.A /M.Sc II Semester Degree Examination

STATISTICS

(Practical Based on HCT 2.2)

Paper - HCP 2.2

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

Instructions to Candidates: **Answer any Two questions.**

All questins Carry equal marks.

1. The data below correspond to the amount of energy required to complain pain by the narrow beam of light directed towards the arms of young men:

45, 32, 34, 31, 35, 37, 31, 30

Assume that the corresponding random variable follows normal distribution with mean θ and variance 25. At 5% level of significance, test $H_0: \theta \leq 34.3$ v/s $H_1: \theta < 34.3$. Also compute the power function at the following values of θ :

34, 36, 38, 40, 42.

2. The heart weights in gms of 15 cats are given by

7.4, 7.3, 7.1, 9.0, 7.6, 9.5, 10.1, 10.2, 10.1, 9.5, 8.7, 7.2, 8.3, 9.6, 8.0

Assume that the above observations are from $N(\mu, \sigma^2)$ at 5% level of significance, test the following hypothesis.

a) $H_0 : \mu = 8.5 \; v/s \; H_1 : \mu \neq 8.5$

b) $H_0 : \sigma^2 = 8.6 \; v/s \; H_1 : \sigma^2 \neq 8.6$

3. The following is random sample from bivariate normal vector (X,Y), test for the independence of X and Y at 5% level of significance.

X	5.4	4.82	5.22	5.37	5.35	4.9	5.17	4.93	5.62	5.35
Y	5.45	4.18	5.20	5.35	5.45	4.19	5.15	4.95	5.6	5.25

4. a) A random sample of size 8 is taken from a continuous distribution. The sample values are as follows:

-0.465, 0.12, -0.238, -0.869, -1.016, 0.471, 0.056 and 0.561

At 5% level of significance test the hypothesis that the population median is -1 against it is greater than -1, using signed rank test. Also carry out the test using normal approximation.

b) To compare the variability of two brands of tyres of type A and B, the following mileages were obtained for 8 tyres of each type.

Brand A	32.1	20.6	17.8	28.4	19.6	21.4	19.9	30.1
Brand B	19.8	27.6	30.8	27.6	34.1	18.7	16.9	17.9

At 5% level of significance, test the hypothesis that the two samples have come from the same population using U- test and also use the normal approximation and carryout the test. **(5+10)**

Roll No _____ [Total No. of Pages : 2

PG2S-312-B-23

M.A /M.Sc II Semester Degree Examination

STATISTICS

(Practical Based on HCT 2.2)

Paper - HCP 2.2

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

Instructions to Candidates: **Answer any Two questions.**

All questins Carry equal marks.

1. The data below correspond to the amount of energy required to complain pain by the narrow beam of light directed towards the arms of young men:

45, 32, 34, 31, 35, 37, 31, 30

Assume that the corresponding random variable follows normal distribution with mean θ and variance 25. At 5% level of significance, test $H_0: \theta \leq 34.3$ v/s $H_1: \theta < 34.3$. Also compute the power function at the following values of θ :

34, 36, 38, 40, 42.

2. The heart weights in gms of 15 cats are given by

7.4, 7.3, 7.1, 9.0, 7.6, 9.5, 10.1, 10.2, 10.1, 9.5, 8.7, 7.2, 8.3, 9.6, 8.0

Assume that the above observations are from $N(\mu, \sigma^2)$ at 5% level of significance, test the following hypothesis.

a) $H_0 : \mu = 8.5 \; v/s \; H_1 : \mu \neq 8.5$

b) $H_0 : \sigma^2 = 8.6 \; v/s \; H_1 : \sigma^2 \neq 8.6$

3. The following is random sample from bivariate normal vector (X,Y), test for the independence of X and Y at 5% level of significance.

X	5.4	4.82	5.22	5.37	5.35	4.9	5.17	4.93	5.62	5.35
Y	5.45	4.18	5.20	5.35	5.45	4.19	5.15	4.95	5.6	5.25

4. a) A random sample of size 8 is taken from a continuous distribution. The sample values are as follows:

-0.465, 0.12, -0.238, -0.869, -1.016, 0.471, 0.056 and 0.561

At 5% level of significance test the hypothesis that the population median is -1 against it is greater than -1, using signed rank test. Also carry out the test using normal approximation.

b) To compare the variability of two brands of tyres of type A and B, the following mileages were obtained for 8 tyres of each type.

Brand A	32.1	20.6	17.8	28.4	19.6	21.4	19.9	30.1
Brand B	19.8	27.6	30.8	27.6	34.1	18.7	16.9	17.9

At 5% level of significance, test the hypothesis that the two samples have come from the same population using U- test and also use the normal approximation and carryout the test. **(5+10)**