

(FOR THE CANDIDATES ADMITTED
DURING THE ACADEMIC YEAR 2023 ONLY)

23UMS2A2

REG.NO. :

N.G.M.COLLEGE (AUTONOMOUS) : POLLACHI
END-OF-SEMESTER EXAMINATIONS : MAY-2024
COURSE NAME: B.Sc.- MATHEMATICS **MAXIMUM MARKS: 75**
SEMESTER: II **TIME : 3 HOURS**

PART - III
MATHEMATICAL STATISTIC - II

SECTION – A (10 X 1 = 10 MARKS)

ANSWER THE FOLLOWING QUESTIONS.

MULTIPLE CHOICE QUESTIONS.

K1

- The coefficient of correlation_____.
a) can take any value between -1 and +1
b) is always less than - 1
c) is always more than + 1
d) cannot be zero
- What are the conditions in which Type-I error occurs?
a). The null hypotheses get accepted even if it is false
b). The null hypotheses get rejected even if it is true
c). Both the null hypotheses as well as alternative hypotheses are rejected
d). None of the above
- What is a disadvantage of the chi-square test?
a) It cannot be used for continuous distributions
b) It cannot be used for discrete distributions
c) Samples sizes must be small
d) Sample sizes must be large
- A t-test is a significance test that assesses_____.
a) in testing the stationary of the series
b) in comparing multiple groups to see if there means differ
c) in comparing two groups to see if their means differ
d) in testing the goodness of fit of a model
- Cramer-Rao inequality provides _____ to the variance of an unbiased estimator
a) Upper and lower bound
b) lower bound
c) upper bound
d) none

ANSWER THE FOLLOWING IN ONE (OR) TWO SENTENCES.

K2

- Write any two properties of Regression coefficients,
- Define null hypothesis.
- What is a chi square distribution?
- Write the applications of F- distribution.
- If T is an unbiased estimator for θ . show that T^2 is a biased estimator for θ^2 .

SECTION – B (5 X 5 = 25 MARKS)

ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS. K3

- a) Calculate the correlator coefficient for the following heights (in inches) of fathers (X) and their sons (Y) :

X	65	66	67	67	68	69	70	72
Y	67	68	65	68	72	72	69	71

(CONTD.....2)

(OR)

11. b) Calculate the correlator coefficient for the following data.

Student:	A	B	C	D	E	F	G	H	I	J
IR	105	104	102	101	100	99	98	96	93	92
FR	101	103	100	98	95	96	104	92	97	94

- 12.a) Twenty people were attacked by a disease and only 18 survived. Will you reject the hypothesis that the survival rate, if attacked by this disease, is 85% in favour of the hypothesis that it is more, at 5% level?

(OR)

- b) In a sample of 1,000 people in Maharashtra, 540 are rice eaters and the rest are wheal eaters. Can we assume that both rice and wheat are equally popular in this State at 1% level of significance?

- 13.a) A sample of 900 members has a mean 3.4 cms, and s.d. 2.61 cms. Is this sample from a large population of mean 3.25 cms. and s.d. 2.61 cms?

(OR)

- b) Test the hypothesis that
- $\sigma=10$
- , given that
- $s = 15$
- for a random sample of size 50 from a normal population.

- 14.a) Below are given the gain in weights (in lbs.) of pigs fed on two diets A and B. . Gain in weight

Diet A : 25, 32, 30, 34, 24,14, 32, 24, 30, 31, 35, 25

Diet B : 44,34,22,10,47,31,40,30,32,35,18,21,35,29,22

Test if the two diets differ significantly as regards their effect on increase in weight.

(OR)

- b) A random sample of 27 pairs of observations from a normal population gave a correlation coefficient of 0.6. Is this significant of correlation in the population?

- 15.a) Obtain the MVB estimator for
- μ
- in the normal population
- $N(\mu, \sigma^2)$
- , where
- σ^2
- is known.

(OR)

- b) P rove that “If a sufficient estimator exist, it is a function of the Maximum Likelihood Estimator”.

SECTION – C (5 X 8 = 40 MARKS)**ANSWER EITHER (a) OR (b) IN EACH OF THE FOLLOWING QUESTIONS.**

16. a) Find the equation of regression lines and correlation Coefficient for following data

X	28	41	40	38	35	33	46	32	36	33
Y	30	34	31	34	30	26	28	31	26	31

(OR)

- b) Calculate the correlation coefficient for the following data

Class-Y	90-100	100-110	110-120	120-130
Class-X				
50-55	4	7	5	2
55-60	6	10	7	4
60-65	6	12	10	7
65-70	3	8	6	3

(CONTD.....3)

17. a) Random samples of 400 men and 600 women were asked whether they would like to have a flyover near their residence. 200 men and 325 women were in favour of the proposal. Test the hypothesis that proportions of men and women in favour of the proposal, are same against that they are not, at 5% level.

(OR)

- b) A company has the head office at Calcutta and a branch at Bombay. The personnel director wanted to know if the workers at the two places' would like the introduction of a new plan of work and a survey was conducted for this purpose. Out of a sample of 500 workers at Calcutta. 62% favoured the new plan. At Bombay out of a sample of 400 workers, 41% were against the new plan. Is there any significant difference between the two groups in their attitude towards the new plan at 5% level

18. a) Fit a Poisson distribution to the following data and test the goodness of fit.

x:	0	1	2	3	4	5	6
f:	275	72	30	7	5	2	1

Is this result consistent with the hypothesis that male and female births are equally probab

(OR)

- b) A survey of 320 families with 5 children each revealed the following distribution:

No. of boys	5	4	3	2	1	0
No. of girls	0	1	2	3	4	5
No. of families	14	56	110	88	40	12

Is the result consistent with hypothesis the male and female birth are equally probable?

19. a) In one sample of 8 observations, the sum of the squares of deviations of the sample values from the sample mean was, 84.4 and in the other sample of 10 observations it was 102.6. Test whether this difference is significant at 5 per cent level, given that the 5 per cent point of F for $n_1 = 7$ and $n_2 = 9$ degrees of freedom is 3.29.

(OR)

- b) Two random samples gave the following results

Sample	Size	Sample mean	Sum of squares of deviations from mean
I	10	15	90
II	12	14	108

Test whether the samples come from the same' normal population at 5% level of significance.

20. a) State and prove Cramer-Rao Inequality.

(OR)

- b) $X_1, X_2, \text{ and } X_3$ is a random sample of size 3 from a population with mean value μ and variance σ^2 . If T_1, T_2, T_3 are the estimators used to estimate mean value μ , where

$$T_1 = X_1 + X_2 - X_3, \quad T_2 = 2X_1 + 3X_3 - 4X_2, \text{ and } T_3 = (\lambda X_1 + X_2 + X_3)/3$$

- Are T_1 and T_2 unbiased estimators?
- Find the value of λ such that T_3 is unbiased estimator μ .
- With this value of λ . is T_3 a consistent estimator?
- Which is the best estimator?