

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Fourth Semester B.Sc Degree Examination, March 2018
ST4B04 – Testing of Hypothesis
(2016 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Part A**Answer All Questions. Each question carries 1 mark**

1. Probability of rejecting a false null hypothesis is known as
2. Large sample tests are application oftheorem.
3. Region of rejection of null hypothesis is called.....
4. If X has $N(\mu, \sigma^2)$, which of the following is a simple hypothesis?
a) $\mu=10, \sigma^2 < 4$ b) $\mu < 10, \sigma^2 = 4$ c) $\mu < 10, \sigma^2 < 4$ d) $\mu = 10, \sigma^2 = 4$
5. Which of the following is a two sided hypothesis
a) $\theta = \theta_0$ b) $\theta \neq \theta_0$ c) $\theta < \theta_0$ d) $\theta > \theta_0$
6. In testing significance of observed correlation coefficient, the degree of freedom of test statistic is
7. Testing equality of two dependent population means is known as
8. Run test is used for testingof a set of observations
9. Kolmogrov _ Smirnov test is used for testing
10. In the case of large number of classes, Kruskal- Wallis test is approximated todistribution.
11. Equality of several population means is tested using Test.
12. Ordinary sign test is based on..... distribution.

(12 x 1 = 12 Marks)**Part B****Answer Any Seven Questions. Each question carries 2 marks**

13. Define Simple and Composite Hypothesis.
14. Define Type I and Type II Errors in testing of hypotheses.
15. Define test of a Statistical hypothesis.
16. Define P _ Value.
17. State the test statistic used for testing equality of two population proportions.
18. Define Contingency Table.
19. Define UMP test.
20. State assumptions of t – test.
21. Define Run.

(7 x 2 = 14 Marks)

Part C

Answer Any Six Questions. Each question carries 5 marks

22. Let X be a single observation taken from $P(\lambda)$ to test $H_0 : \lambda = 2$ against $H_1 : \lambda = 4$, and H_0 is rejected if $X > 3$. Obtain size and power of the test.
23. A manufacturer claims that not more than 7% of the items produced by him are defective. To test this, a random sample of 500 items was selected and 29 were found to be defective. Test the claim at 5% level of significance.
24. Derive large sample test for testing equality of two population means.
25. Briefly explain the procedure of testing significance of an observed correlation coefficient.
26. The following data gives diameter of axles (in mms), selected randomly from a production process. 3.081, 3.084, 3.082, 3.080, 3.081, 3.082, 3.083, 3.085, 3.084, 3.083. Test whether the expected standard deviation of axles is 0.002mms.
27. Briefly explain the merits and demerits of Non Parametric tests.
28. Explain Kolmogrov – Smirnov test.
29. Explain Sign test.

(6 x 5 = 30 Marks)

Part D

Answer Any Three Questions. Each question carries 8 marks

30. State and Prove Neyman – Pearson Lemma.
31. The following data gives weight (in grams) of chicks treated with two different feeding stuffs A and B
A: 127, 125, 131, 139, 128, 130, 134
B: 136, 137, 139, 140, 138, 141
Do this data support the claim that feeding stuff B is superior than A
32. The life of certain IC chips were as follows

Life in hours	0 – 20	20 – 40	40 - 60	60 - 80	80 - 100
No: of chips	137	102	84	59	18

Fit an exponential distribution and test goodness of fit.

33. Explain i) Median Test and ii) Mann – Whitney test
34. Briefly explain F test for equality of variances. The following data gives mileage('000 kms) of two brands of tyres P and Q tested under standard conditions

P	:	39	41	44	37	38	
Q	:	40	41	39	42	41	40

Test whether brand Q is more consistent than P.

(3 x 8 = 24 Marks)

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Fourth Semester B.Sc Degree Examination, March 2018
ST4C04 – Applied Statistics
(2016 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Part A

(Answer all questions)

1. Items included in a study are called
2. The process of collecting information from the units of population is called
3. If destructive tests are involved in the collection of information, the only method that can be adopted is
4. The analysis of variance technique was first devised by
5. The error degrees of freedom for two way ANOVA with 'm' rows and 'n' columns is.....
6. Linear trend of a time series indicates.....
7. An additive model of time series with the components T, S, C and I is
8. The ratio of price of a commodity in the current year to that in the base year expressed as a percentage is called
9. The arithmetic mean of Laspeyer's and Paascher's index numbers is called.....
10. The process control is achieved through the technique of
11. The 3-σ control limits for C- chart are and
12. The control chart for number of defects is.....

(12×1=12 marks)

Part B

(Answer any seven questions)

13. Define population and sample
14. What is the law of inertia of large numbers?
15. What is analysis of variance?
16. State the null hypothesis of two way ANOVA
17. List out the components of a time series.
18. What are short term fluctuations?
19. Index numbers are called Economic Barometers. Why?
20. What are value index numbers?
21. What is meant by statistical quality control?

(7×2=14 marks)

Part C

(Answer any six questions)

22. What are the principal steps in a sample survey?
23. What are the essentials of sampling?
24. Explain the significance of analysis of variance.
25. Explain semi average method of measuring trend. In what way it is better than free hand method.

26. What are the problems in the construction of Index Numbers?
27. Explain the following terms: Specification limits, Assignable causes and Acceptance sampling.
28. Explain how \bar{X} and R charts are used to control the quality of products in the industry.
29. Ten pieces of cloth out of different rolls of equal length obtained the following number of defects. 1, 3, 5, 0, 6, 0, 9, 4, 4, 3.
Draw a control chart for the number of defects and state whether the process is in the state of statistical control.

(6×5=30 marks)

Part D
(Answer any three questions)

30. In a population of size, $N=6$ the values x_i are 8,3,3,11,4,7. Calculate the sample mean \bar{x} of all possible simple random samples of size 2. Verify that \bar{x} is unbiased.
31. Carry out the analysis of variance of the following data showing production quantities by three machines:
- A : 4 6 8
B : 4 3 5 12
C : 8 6 6 9 10
32. Find out seasonal fluctuations by the method of moving averages for the data given below.

Year	1 st quarter	2 nd quarter	3 rd quarter	4 th quarter
1990	30	40	36	34
1991	34	52	50	44
1992	40	58	54	48
1993	54	76	68	62
1994	80	92	86	82

33. Calculate Fisher's index number for the following data and examine whether it satisfies factor reversal test.

Commodity	Base year		Current year	
	Price	Quantity	Price	Quantity
A	2	20	4	45
B	4	24	5	30
C	6	30	8	40
D	8	40	10	60

34. The following data refers to visual defects found during the inspection of the first 10 samples of size 50 each from a lot of two-wheelers manufactured by an automobile company.

Sample number	1	2	3	4	5	6	7	8	9	10
Number of defectives	4	3	2	3	4	4	4	1	3	2

Draw the 'p' chart and show that the fraction defectives are under control.

(3×8=24 marks)

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Reg. No:.....

Name:

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE
Fourth Semester B.Sc Degree Examination, March 2018
AS4C04 – Probability Models & Risk Theory
(2016 Admission onwards)

Max. Time: 3 hours

Max. Marks: 80

Part-A

[Answer all Questions. Each question carries 1 marks]

1. If security loading, $\theta=0.4$. The premium income per annum is 40%the expected rate of claims outgo.
a) Less than b) Greater than c) Equal to d) None of these
2. The collective risk model views total claims as a distribution.
3. Which type of skewness does the loss distribution usually has?
4. Give the formula for surplus process at any time t .
5. Aggregate claims amounts may be modeled using distribution.
a) Discrete b) Compound c) Conditional d) Continuous
6. If the insurer is certain to be ruined at some point, then:
a) Premium income is less than the rate at which claims are paid out
b) Premium income is greater than the rate at which claims are paid out
c) Premium income is equal to the rate at which claims are paid out
d) None of the above.
7. If the number of claims is zero, the value of aggregate claims
8. When disability insurance is issued to a group, then it is known as
9. If the claim frequency follows Poisson distribution with mean 15 and claim size is exponential distribution with mean 3, what is the mean of total claim?
10. is the percentage by which the rate of premium income exceeds the rate of claim outgo.

State whether True or False:

11. Binomial is one of the most common distributions used for modeling claim frequency
12. The compound Poisson distribution has an additive property

(12x1=12 Marks)

Part-B

[Answer any 7 Questions. Each question carries 2 marks]

13. What are the fundamental assumptions under the collective risk models?
14. Explain Surplus formula
15. Define aggregate claim process.
16. Define compound Negative binomial distribution.
17. Obtain the mean and variance of the claim random variable X , where $q=0.04$ and the claim amount is fixed at 150.
18. What do you mean by severity of the claim?
19. Explain stop loss reinsurance.
20. Suppose $N \sim \text{Poisson}(2)$ and $X \sim \text{Exp}(3)$. Find $M_s(1)$.
21. Suppose that the claim amount distribution is discrete with $p(1)=1/4$ and $p(2)=3/4$. If $R=\log 2$, Calculate θ .

(7x2=14 Marks)

Part-C

[Answer any 6 Questions. Each question carries 5 marks]

22. If the claims distribution with $P(1)=P(2)=1/2$, then determine θ if it is given that $R=\log 3$.
23. Explain Translated Gamma Distribution.
24. Show that if N has a Poisson distribution with parameter λ , the distribution of $Z = \frac{N-\lambda}{\sqrt{\lambda}}$ approaches a $N(0, 1)$ distribution as λ tends to ∞ .
25. Distinguish between life insurance and casualty insurance.
26. The number of claims arising from a particular group of policies has a negative binomial distribution with parameters $k=4$ and $p=0.8$. Individual claim amounts have the following distribution $P(X=500)=0.5$, $P(X=1000)=0.25$ and $P(X=2000)=0.25$. The aggregate claim is denoted by S . calculate $P(S \leq 20000)$ using normal approximations.
27. Explain compound Poisson distribution.
28. If S has a gamma distribution, show that

$$E[I_d] = \frac{\alpha}{\beta} [1 - G(d; \alpha + 1, \beta)] - d[1 - G(d; \alpha, \beta)]$$

29. a) Explain the concept of convolution.
- b) The distributions of aggregate claims from two risks, denoted by S_1 and S_2 , are as follows:
 S_1 has a compound Poisson distribution with parameter 100 and distribution function $F_1(x) = 1 - \exp(-x/\alpha)$, $x > 0$ and S_2 has a compound Poisson distribution with parameter 200 and distribution function $F_2(x) = 1 - \exp(-x/\beta)$, $x > 0$. If S_1 and S_2 are independent, what is the distribution of $S_1 + S_2$?

(6x5=30 Marks)

Part-D

[Answer any 3 Questions. Each question carries 8 marks]

30. Define adjustment coefficient. Derive an expression for adjustment coefficient in the special case where W_i 's common distribution is $N(\mu, \sigma^2)$.

31. Suppose that $\lambda=2$, $c=6$ and $f(x) = \frac{3}{2}e^{-3x} + \frac{7}{2}e^{-7x}$, $x > 0$.

Calculate a) P_1 b) θ

c) $M_X(r)$

32. Explain inverse Gaussian distribution also find its mean and variance using m.g.f.

33. The number of claims in an insurance company follows type 2 negative binomial distribution with mean and variance equal to 100 and 150 respectively. Individual claim amounts follow exponential distribution with mean 100. Deduce MGF of aggregate claims and calculate mean and variance.

34. Explain the probability of ruin in discrete time.

(3x8=24 Marks)