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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Fourth Semester B.Sc Statistics Degree Examination, March/April 2020**

**BASC4C04 – Probability Models and Risk Theory**

(2018 Admission onwards)

Time: 3 hours                                                    Max. Marks : 80

## PART-A

### Answer *all* questions. Each question carries *one* mark

1. Mean of compound distribution E(S) =

   a) E(N)E(X)          b) E(N)E(S)   c) E(N)              d) none

2. Variance of Compound Poisson distribution var(S) =

   a) $\lambda m_1$          b) $\lambda m_2$          c) $\lambda m_3$          d) none

3. Total claims is calculated based on group of policy _____

   a) Individual Risk Model          b) Collective Risk Model

   c) Group Risk Model               d) None of these

4. Mean of Compound binomial distribution E(S)=_____.

   a) n              b) npq              c) $nqm_1$              d) none of these

5. The probability of risk event relatively _____.

   a) big              b) small          c) medium              d) none

6. What is the individual Risk Model?

7. What is zero sum two players game?

8. Reinsurance is _____ for insurance companies.

9. In surplus reinsurance, the proportions are the same for all risks – True or False.

10. What is quota share reinsurance?

11. Reinsurance is _____ for insurance companies.

12. What is the initial surplus of the insurance company?

                                                            **(12 x 1= 12Marks)**

## PART-B

**Answer any *seven* questions. Each question carries *two* marks.**

13. What is the saddle point?

14. What is the risk function?

15. Define stop loss reinsurance.

16. Define compound distribution.

17. Define non proportional reinsurance.

18. What is the adjustment coefficient?

19. Define the probability of ruin.

20. What is the meaning of optimum strategy?

21. Define the premium loading factor.

(7 x 2= 14 Marks)

## PART-C

**Answer any *six* questions. Each question carries *five* marks.**

22. Write the difference between individual and collective risk model.

23. Derive the moments of Compound Poisson distribution.

24. Write the probability of ruin in discrete time.

25. Alice and Bob each throw a fair coin. If the coins both come down heads or both comedown tails, Alice pays Bob £1. Otherwise, Bob pays Alice £1. Write down the payoff matrix for the game.

26. $\begin{pmatrix} 6 & 2 & 2 \\ 4 & 3 & 5 \\ -3 & 1 & 0 \end{pmatrix}$ Find the saddle point?

27. Draw the diagram shows how much the direct writer and the reinsurer would pay (a) under a 25% quota share arrangement and (b) under an individual XOL arrangement with a reinsurance layer of £30,000 in excess of £20,000 when there are claims for £30,000, £55,000 and £15,000.

28. Write the claim amount paid by insurer and reinsurer under quota share reinsurance.

29. The table below shows the payoffs to Player B in a 3 by 2 zero-sum two-person game:

| Player A | | | |
|---|---|---|---|
| Player B | I | II | III |
| 1 | -2 | 3 | 9 |
| 2 | 6 | 5 | 7 |

Find the value of the game if both players adopt a pure strategy based on the minimax criterion.

**(6 x 5= 30 Marks)**

## PART-D
**Answer any *three* questions. Each question carries *eight* marks.**

30. Write the mean and variance of the claim amount paid by both insurer and reinsurer under excess of loss reinsurance.

31. The table below gives the payoff matrix for a 2 by 2 zero-sum two-person game: Find the randomised strategies that should be adopted by each player, and the value of the game.

| Player A | | |
|---|---|---|
| Player B | I | II |
| 1 | 6 | -1 |
| 2 | 0 | 4 |

32. Derive the moments of compound binomial distribution.

33. An insurer knows from past experience that the number of claims received per month has a Poisson distribution with mean 15, and that claim amounts have an exponential distribution with mean 500. The insurer uses a security loading of 30%. Calculate the insurer's adjustment coefficient and give an upper bound for the insurer's probability of ruin, if the insurer sets aside an initial surplus of 1,000.

34. Write the application of individual risk model in insurance.

**(3 x 8= 24 Marks)**

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Fourth Semester B.Sc Degree Examination, March/April 2020**

**BSTAT(PSY4)C02– Psychological Statistics**

(2018 Admission onwards)

Time: 3 hours

Max. Marks : 80

## PART-A

### Answer *all* questions. Each question carries *one* mark

1. Wilcoxen test is using for assessing ..........

   a) Association     b) Differences   c)Normality   d) Validity

2. ANOVA is used for measuring

   a) Difference     b) Inference   c) Relativity   d) Sample Space

3. Degrees of freedom for Chi-square test in case of contingency table of order (2x2) is

   a) 3       b) 4       c) 2   d) 1

4. Nominal scale has ......... compared to other scale of measurement

   a) Magnitude     b) Absolute Zero     c) Equal interval     d) none of the above

5. ........ Statistical method can be used to calculate inter-rate reliability.

6. When number of positive signs and negative signs are equal in a sign test, the null hypothesis will be ..............

7. ...... is a statistical model describing how will it fits a set of observations.

8. The consistency of scores on different occasions by the same individual is known as ..............

**True/ False:**

9. For a non-parametric test, the sample observations should be independent.

10. Range of standardized regression coefficient is 0 and 1.

11. Probability to reject null hypothesis when it is true is called as alpha error

12. In two-way classification model we assume that all columns and rows are equal.

**(12 x 1= 12Marks)**

## PART-B

### Answer any *seven* questions. Each question carries *two* marks.

13. Define non-parametric test.

14. What is a run test?

15. What is ANOVA?

16. Define Critical region

17. Define Eigen values

18. Explain Krushkal – Wallis H Test.

19. When do you consider Yates Correction for test?

20. What is the concept of absolute zero point?

21. What is item discrimination?

(7 x 2= 14 Marks)

## PART-C
**Answer any *six* questions. Each question carries *five* marks.**

22. What are the differences between parametric and non-parametric test?

23. How do you prepare a questionnaire?

24. Explain the concept of one-tailed and two tailed tests.

25. Discuss the uses of Logistic Regression

26. Test the Hypothesis that "There is no difference in depression before and after CBT"

based on the data given below using signed rank test.

| Patient | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---------|---|---|---|---|---|---|---|---|---|----|
| Pre test | 2 | 2 | 3 | 1 | 2 | 1 | 2 | 2 | 7 | 9 |
| Post test | 2 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 3 | 1 |

27. What is the test of homogeneity of proportions?

28. Discuss the various assumptions of one-way analysis of variance technique.

29. What is Reliability? Explain any two methods to find it?

(6 x 5= 30Marks)

## PART-D
**Answer any *three* questions. Each question carries *eight* marks.**

30. Explain the technique of Analysis of variance in two-way classification of data.

31. Develop the ANOVA for the following data.

| Varieties | | | |
|---|---|---|---|
| A | B | C | D |
| 200 | 230 | 250 | 300 |
| 190 | 270 | 300 | 270 |
| 240 | 150 | 145 | 180 |

32. Explain different parametric tests and their uses?

33. Describe the stages of scale construction.

34. Define Validity. Explain the various types of Validity?

(3 x 8= 24Marks)

*50*

# FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

## Fourth Semester B.Sc Mathematics Degree Examination, March/April 2020

## BSTA4C04 – Applied Statistics

(2018 Admission onwards)

Time: 3 hours                                          Max. Marks : 80

### Part A

### (Answer all questions)

1. Any value computed using sample observation is _____

2. If we increase sample size Standard error_____

3. The null hypothesis of ANOVA is_____

4. In analysis of variance the error follow_____ distribution.

5. Method of least square is used to remove _____ of a time series data.

6. Fisher's index number is _____ of Laspyre's and Paacshe's index numbers.

7. _____ is a statistical device which is used to improve the quality of a product.

8. _____ is a control chart for fraction of defectives.

### Write true or false

9. Sampling and non sampling errors are present in census.

10. The equality of several normal population means can be tested by F test.

11. Graphic method is used to measure seasonality of a time series.

12. $\bar{X}$ chart is a control chart for variables.

                                              **(12x1=12 Marks)**

### Part B

### (Answer any seven questions)

13. How will you select a sample using lottery method?

14. Distinguish between census and Sampling.

15. What is Analysis of Variance?

16. What are the assumption of ANOVA?

17. Describe the utility of time series.

18. Explain method of least squares.

19. What is time reversal test?

20. What are assignable causes?

21. What are the uses of statistical quality control?

                                              **(7x2=14 Marks)**

## PART C
### (Answer any six questions)

22. Explain sampling error and non-sampling error.

23. Distinguish between stratified random sampling and systematic sampling.

24. Explain different stages of conducting two way ANOVA and obtain ANOVA table.

25. Show that fisher's index number satisfies time reversal test and factor reversal test.

26. Define trend of a time series. Explain method of moving average of obtaining trend.

27. Calculate Seasonal index for the following data by using simple average method.

| Year | Quarter 1 | Quarter 2 | Quarter 3 | Quarter 4 |
|------|-----------|-----------|-----------|-----------|
| 2000 | 72 | 68 | 80 | 70 |
| 2001 | 76 | 70 | 82 | 74 |
| 2002 | 74 | 66 | 84 | 80 |
| 2003 | 76 | 74 | 84 | 78 |
| 2004 | 78 | 74 | 86 | 82 |

28. Distinguish between control chart for variables and control chart for attributes.

29. 15 samples of 50 bulbs each were examined in a fortnight's production. The number of defective bulbs in each sample was recorded as below. Draw the control chart for the fraction of defectives and commend on the state of control.

| Sample No | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|-----------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|
| No. of defectives | 12 | 9 | 15 | 14 | 10 | 8 | 6 | 12 | 9 | 5 | 12 | 10 | 11 | 9 | 10 |

(6x5=30 Marks)

## PART D
### (Answer any three questions)

30. Yu have been asked to conduct a statistical enquiry. Outline the preliminary steps that you would take before commencing the work of collection of data.

31. Five different brands of tyres used by a car rental agency in the process of deciding the brand of tyre to purchase as their standard equipment of their fleet, found that each of five tyres of each brand last the following number of kilometres(in1000s)

Tyre brand

| A | B | C | D | E |
|---|---|---|---|---|
| 36 | 46 | 35 | 45 | 41 |
| 37 | 39 | 42 | 36 | 39 |
| 32 | 35 | 37 | 39 | 37 |
| 48 | 37 | 43 | 35 | 35 |
| 47 | 48 | 38 | 32 | 38 |

Test the hypothesis that the five tyre brands have identical average life.

32. From the following data, calculate Laspeyre's , Paasche's , Fisher's and Marshall-Edge worth index numbers.

| Item | Base Year | | Current Year | |
|------|-----------|----------|--------------|----------|
| | Price | Quantity | Price | Quantity |
| A | 10 | 49 | 12 | 50 |
| B | 12 | 25 | 15 | 20 |
| C | 18 | 10 | 20 | 12 |
| D | 20 | 5 | 40 | 2 |

33. Fit a trend line to the following data by the least square method.

| Year | 2005 | 2007 | 2009 | 2011 | 2013 |
|------|------|------|------|------|------|
| Production (in'000 tons) | 18 | 21 | 23 | 27 | 16 |

Estimate the production in 2015

34. a)Explain the procedure of construction of $\bar{X}$ chart and R chart.

b)Distinguish between defects and defectives.

(3 x 8 = 24 Marks)

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## FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Fourth Semester BSc Degree Examination, March/April 2020**

**BSTA4B04 – Testing of Hypothesis**

(2018 Admission onwards)

: 3 hours                                            Max. Marks : 80

### Part A(Answer ALL questions)

1. Rejecting null hypothesis when it true, is ------------------

    a) Type I error       b) Power           c) Type II error      d) None of these

2. To test for population mean in the case of large sample, we use

    a) t- test          b) z test            c) F test           d) Chi-square test

3. The test for equality of variance is -----

    a) F test         b) Chi-square test     c) t test           d) Run test

4. Which of the following is a test for equality of three population means

    a) ANOVA        b) Paired t test      c) Median test       d) F test

5. Whether a test is one sided or two sided depends upon

    a) Null hypothesis    b) Alternative hypothesis     c)Level of significance d) None of these

6. The ......... lemma provides the best critical region for testing simple hypothesis

7. T-tests are usually used for testing....................

8. In a contingency table with k columns and p rows, the d.f for the test statistic, is .....

9. Median test is used to................

10. The test for correlation coefficient is -----

11. For testing ratio of variances the test statistic follows ------distribution

12. In one way ANOVA with n experimental units and k treatments, the error degrees of freedom is.....

                                             **(12 x 1=12 Marks)**

### Part B (Answer any SEVENquestions)

13. Define simple hypothesis.

14. Distinguish between type 1 and type II errors hypothesis.

15. Write down the test statistic for testing equality of population means in small sample and large sample situations.

16. What is paired t-test? Give example

17. Explain chi-square test for independence of attributes.

18. Write down two applications of Chi-square distribution in testing.

19. Write down ANOVA table.

What is mean by non parametric tests. Give two examples

State the null hypothesis and situations where we use Mann Whiteny test.

**(7x2=14 Marks)**

## Part C (Answer any SIX questions)

State Neymann Pearson lemma.

Distinguish between Most Powerful tests and Uniformly most Powerful Tests.

Explain the method of z-test

Suppose a coin toss turns up 12 heads out of 20 trials. At 0.05 significance level, can one reject the null hypothesis that the coin toss is fair?

Explain the Krusikal Wallies test.

A sample of 30 pairs of observations from a Normal population gave a correlation coefficient 0.15. Test whether the correlation is significant or not.

Write down statistic of Kolmogorov- Smirnov test for single sample.

Explain t- test.

**(6x5=30 Marks)**

## Part D(Answer any THREE questions)

If $x \geq 2$ is the critical region for testing $\theta = 3$ against $\theta = 1$, on the basis of a single observation from the population, $f(x) = \theta e^{-\theta x}$, $x \geq 0$, obtain the values of Type I and Type II errors.

Explain the steps involved in testing difference of means of two Normal populations clearly stating different situations..

Given below are the gain in weights (in Kg) of pigs fed on two diets A and B.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

Test if the two diets differ significantly in their effect on increasing weights.

A sample of size 50 is taken from a population with sample mean 68.2 and sample variance 2.5. Another sample of size 50 with sample mean 67.5 and sample variance 2.8 is taken from another population. Test the equality of mean of these two populations.

Suppose the mean weight of King Penguins found in an Antarctic colony last year was 15.4 kg. In a sample of 35 penguins same time this year in the same colony, the mean penguin weight is 14.6 kg. Assume that the population standard deviation is 2.5 kg. At 0.05 significance level, can we reject the null hypothesis that the mean penguin weight does not differ from last year?

**(3x8=24 Marks)**