1B3N19227 (Pages : 2) Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Statistics Degree Examination, November 2019

BASC3C03 – Life Contingencies and Principles of Insurance

(2018 Admission onwards)

Time: 3 hours Max. Marks: 80

PART- A

Answer all the questions. Each question carries one mark.

Fill in the blanks

1. Gross premium is the premium calculated with____________
2. Net premium is without allowing ____________
3. Expected present value of income= ____________________
4. Risk is _________ of outcome.
5. Insurance contract is transfer of _________
6. Utility means____________
7. Risk averse investor utility function is ___________ of wealth.

Say true or false

8. Prospective reserve value is calculated using accumulated value of the cash flows.
9. Risk seeking investor values an incremental decrease in wealth.
10. The reserve value is needed when expenses is __________ than income.

Choose the correct answer

11. Term assurance policy gives___________ benefits.
    (i) Survival (ii)death (iii) both (iv) none of these
12. If the cost of damage is being met using internal resources or funds how is the risk being managed?
    (i)Prevention (ii) transfer (iii)reduction (iv)retained

(12 x 1 =12 Marks)

PART-B

Answer any seven questions.

Each questioncarries two marks.

13. What is the net premium formula for whole life assurance policy?
14. Write the formula for net premium reserve at time t for an endowment assurance policy.
15. What is the office premium?
16. Writ the Thiele's differential equation.
17. List out 2 general insurance company's name.
18. What is peril?

19. What is the risk averse investor?

20. Write the expected utility theorem. **(7 x 2= 14 Marks)**

PART-C

Answer any sixquestions.
Each question carries five marks.

21. A life aged exactly 50 buys a 15-year endowment assurance policy with a sum assured of £50,000 payable on maturity or at the end of the year of earlier death. Level premiums are payable monthly in advance. Calculate the monthly premium assuming AM92 Ultimate mortality and 4% *pa* interest. Ignore expenses.
22. Derive the Thiele's differential equation.
23. Derive the net premium reserve for the whole life assurance policy.
24. A 10-year term assurance with a sum assured of £500,000 is issued to a male aged 30.Calculate the prospective and retrospective reserves at the end of the fifth year, *ie* just before the sixth premium has been paid, assuming AM92 Ultimate mortality and 4% *pa* interest.
25. Explain The Insurance Contract.
26. What is the Hazard and its types?
27. Write the concept of Pecuniary interest.
28. Explain the expected utility theorem.
29. Write the power utility function. **(6 x 5 = 30 Marks)**

PART- D

Answer any three questions.
Each question carries eight marks.

30. Prove Prospective reserve is equal to the retrospective reserve.
31. A life insurance company issues 20-year temporary assurance policies to lives aged 45.The sum assured, which is payable immediately on death, is £400,000 for the first 10years, and £100,000 thereafter. Level annual premiums are payable in advance for 20years, or until earlier death. The premium basis is: Mortality: AM92 Ultimate Interest: 4% per annum Expenses: nil.(i) Show that the premium payable is approximately £870.25 per annum.(ii) Find the net premium reserve ten years after the commencement of the policy, immediately before the payment of the eleventh premium, assuming the reserving basis is the same as the premium basis.
32. What are the economic characters in terms of utility function?
33. Write the difference between life insurance and general insurance contract.
34. Write the quadratic and log utility functions.

(3 x 8 = 24 Marks)

8

1B3N19218 (Pages : 3) Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2019

BSTAT(PSY3)C03 – Psychological Statistics

(2018 Admission onwards)

Time: 3 hours Max. Marks: 80

Part A

Answer all questions. Each question carries one mark.

Multiple Choice questions

1. The decision on one-sided or two- sided test depends on ....

(a)Composite Hypothesis (b) Alternative Hypothesis

(c) Null Hypothesis (d) Simple hypothesis

2. level of significance is the probability of.......

(a)Type I error (b)Type II error

(c)Not committing error (d) none of the above

3. Large sample tests are conventionally meant for a sample size ....

(a) $n = 20$ (b) $n < 30$

(c) $n \geq 30$ (d) none of the above

4. Stratified samples may be distinguished from quota samples because with a stratified sample elements are selected

(a)Randomly (b)Proportionally

(c)Judgmentally (d) Sequently

5. For a poisson distribution mean = 4, then its variance is

(a) 0 (b) 4 (c) 16 (d) 2

6. A normal distribution is

(a) Continuous (b) Symmetric (c) Rang is $-\infty$ to $+\infty$ (d) All the above

Fill in the Blanks

7. The minimum number of observations required for t-test in a sample is..............

8. Range of F-statistic is............

9. If each and every unit of a population has equal chance of being included in the sample, it is known as..............

10. A list or a map which serves as a guide to cover the population is known as.......

11. Independent samples t- test is used for analyzing the difference between.......... groups

12. Mean and variance of binomial distribution, (n, p) are 2 and 1 respectively then probability of failure is ....

(12x1=12 Marks)

Part B

Answer any seven questions. Each question carries two marks.

13. Define simple hypothesis
14. What is Type II error?
15. Define critical region.
16. What is sampling unit?
17. Describe sampling and non-sampling errors?
18. Give two instances where poisson distribution can be applied
19. What is systematic sampling?
20. Define Sample
21. What is correlation coefficient?

(7x2=14 Marks)

Part C

Answer any six questions. Each question carries five marks.

22. Distinguish between stratified and cluster sampling
23. A sample of 10 observations gives a mean equal to 38 and standard deviation 4. Can we conclude that the population mean is 40 at 5 % level of significance?
24. Explain paired and unpaired t-test
25. Describe the test of correlation
26. Define Binomial distribution, also give three instances where binomial distribution can be applied
27. What are large sample test, discuss in detail
28. Discuss the steps in hypothesis testing
29. Write a brief note on central limit theorem.

(6x5=30 Marks)

Part D

Answer any three questions. Each question carries eight marks.

(a) Explain chi-square test for variance

(b) A certain stimulus administered to each of 10 patients resulted in the following changes in blood pressure 5, 2, 8, -1, 3, -2, 1, 5, 4 and 6. Can it be concluded that the stimulus will be general be accompanied by an increase in blood pressure?

. Fit a Binomial distribution to the following data

No of deaths :	0	1	2	3	4
No of men:	8	32	34	24	5

(a)Explain the method of testing the equality of two population proportion

(b) In a survey of 70 business firms it was found that 45 are planning to expand their capacities next year, Does the sample information contradict the hypothesis that 70 % of the firms are planning to expand next year at 5 % level of significance?

. (a) What are the assumptions made for applications of students t -test?

(b)Explain f-test in testing of hypothesis?

. Define normal distribution? What are the main features of normal distribution? Also explain its importance of normal distribution?

(3x8=24 Marks)

9

1B3N19225 (Pages.: 3) Reg. No:..........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Statistics Degree Examination, November 2019

BSTA3B03 – Theory of Estimation

(2018 Admission onwards)

Time: 3 hours Max. Marks: 80

Part A

(Answer all questions. Each carries 1 mark)

Fill in the blanks (Questions 1-7)

1. The probability distribution of a statistic is ....
2. MLE of the parameter θ of the distribution $f(x) = \frac{1}{2}e^{-|x-\theta|}$ is ....
3. An estimator T of θ is said to be more efficient than any other estimator T^* of θ if and only if ....
4. 95% confidence interval for the ratio of variances of two normal populations involves .... distribution
5. The constant which occur in the pdf is known as ....
6. For the mean squared error to be minimum, bias should be ....
7. Under Bayesian approach, the parameter of a distribution is a ....

Multiple Choice Questions (Questions 8-12)

8. Consistency of an estimator is a

   (a) Small sample property (b) Large sample property

   (c) Property not related to any sample size (d) Property applicable to any sample size

9. A 95% confidence interval for the population proportion based on a large sample proportion P is given by

   (a) $p \pm 2.58\sqrt{\frac{pq}{(n-1)}}$ (b) $p \pm 1.96\sqrt{\frac{pq}{(n-1)}}$

   (c) $p \pm 2.58\sqrt{\frac{pq}{n}}$ (d) $p \pm 1.96\sqrt{\frac{pq}{n}}$

10. For a Poisson population with parameter λ, the MLE based on a sample of size n is

   (a) $\sum_{i=1}^{n} x_i$ (b) $\sum_{i=1}^{n} \frac{x_i}{n}$

   (c) $\frac{\sum(x_i-\bar{x})^2}{n}$ (d) $\frac{\sum(x_i-\bar{x})^2}{(n-1)}$

11. If the variance of the estimator attains the C.R. lower bound, the estimator is

(a) Most efficient (b) sufficient

(c) Admissible (d) Consistent

12. The variance of a Chi-square distribution with 'n' degrees of freedom is

(b) n (b) n^2 (c) $2n$ (d) $\sqrt{n}$

(12 x1 = 12 marks)

Part B

(Answer any seven questions. Each carries 2 marks)

13. Define consistency of an estimator with an example

14. Explain the method of moments

15. Establish the additive property of Chi-square variates

16. Find the lower bound for the variance of any unbiased estimator of θ, where

$$f(x,\theta) = \theta e^{-\theta x} \;;\; x > 0$$

17. Let X be a random variable with pdf

$$f(x,\theta) = \frac{1}{2} \;;\; \theta < x < \theta + 2$$

$$= 0 \;; \text{otherwise}$$

Where θ is any real number. Examine whether There exist any sufficient statistic for θ.

18. Explain the concept of interval estimation

19. Briefly describe the method of least squares

20. Examine whether there exists a sufficient estimator for θ in the case of a Poisson distribution

21. Describe the method to find the confidence interval for the difference between proportions of two populations.

(7 x 2 = 14 marks)

Part C

(Answer any six questions. Each carries 5 marks)

22. If $X_1, X_2, \ldots, X_n$ be a random sample from $N(\mu, 1)$, find an unbiased estimate of μ^2
23. Show that the sample mean $\bar{x}$ is a consistent estimator for μ of $N(\mu, \sigma^2)$.
24. If X_1, X_2, X_3 are independent $N(0,1)$ variates, show that the distribution of $X_1^2 + X_2^2$ and $\frac{2X_1^2}{X_2^2+X_3^2}$ are respectively Chi-square and F distributions
25. Obtain the MLE of θ in the pdf $f(x,\theta) = (1-\theta)x^2;\ 0 < x < 1$ based on a sample of size n. Check whether the estimate is sufficient for θ
26. Give an example each of an estimator that is (i) both unbiased and consistent (ii) not unbiased but consistent
27. A sample drawn from a population with pdf $f(x,\theta) = \theta e^{-\theta x}; x \geq 0$ is 7,1,5,6,2,1,4,5,4. Obtain a 95% confidence interval for θ
28. Find the moment estimates of the parameters m and p of a Gamma distribution
29. Give an example of a case where the MLE of a parameter differs from the estimate obtained by the method of moments

(6 x 5 = 30 marks)

Part D

(Answer any three questions. Each carries 8 marks)

30. Derive Students-t distribution. Prove that the square of a t variate with n degrees of freedom is distributed as $F(1, n)$
31. If T is an unbiased and consistent estimate of θ. Prove or disprove (i) T^2 is unbiased estimate of θ^2 (ii) T^2 is consistent estimate of θ^2
32. State Cramer Rao inequality. Obtain a minimum variance estimate of μ for a normal distribution $N(\mu, \sigma^2)$ where σ^2 is known
33. Describe the method to find MLE. Also show by an example that MLE need not be unbiased
34. Obtain the method to find the confidence interval for variance of a normal population. If a random sample of size 11 from a normal population is found to have variance 12.3, find a 95% confidence interval for the population variance

(3 x 8 = 24 marks)

CO

1B3N19226 (Pages : 3) Reg. No:.............................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Mathematics Degree Examination, November 2019

BSTA3C03 – Statistical Inference

(2018 Admission onwards)

Time: 3 hours Max. Marks: 80

Section-A

[Answer *all* the questions. Each carries 1 mark]

Fill in the blanks:

1. If X follows a standard normal distribution then X^2 follows--------------
2. Fischer Neyman factorization criterion is used to find----------------
3. Standard deviation of the sampling distribution of an estimator is called-------------
4. The probability distribution of the sample mean of 16 random samples taken from a normal population with mean 5 and SD 4 is..........
5. Level of significance is the probability of ------------
6. An efficient estimator is an estimator with minimum........

State whether True or False

7. Parameters are those constants which occur in probability distributions
8. Student's t distribution is symmetric
9. Unbiased estimators are necessarily consistent
10. In a testing procedure, type II error is more serious
11. Consistency is a large sample property
12. A statistical hypothesis which completely specifies the population is simple hypothesis

(12x1=12 Marks)

Section-B

[Answer *any 7* questions. Each carries two marks]

13. Distinguish between estimate and estimator
14. Show that p.d.f of exponential distribution with parameter ½ and chi square distribution with 2 degrees of freedom are same
15. Define a consistent estimator

16. What are the uses of t distribution

17. Write down the test statistic used to test the equality of means of two normal populations, when the variances are known

18. Define null hypothesis and alternative hypothesis

19. Define

    (i) Confidence interval

    (ii) Confidence Coefficent

20. Mention the assumptions involved in tests based on t distribution

21. What is a Statistical Hypothesis?

(7x2=14 Marks)

Section-C

[Answer *any 6* questions. Each carries 5 marks]

22. A manufacturing process is expected to produce goods with a specified weight with variance less than 5 units. A random sample of 10 was found to have variance 6.2 units. Is there reason to suspect that the process variance has increased (use $\alpha = 0.05$)

23. Let $X_1, X_2, ..., X_n$ be a random sample of size n from a Poisson distribution with mean θ. Find a sufficient statistic for θ.

24. A Sample of 400 observations were taken from a population with SD 15. If the mean of the sample is 27. Test whether the hypothesis that the mean of the population is less than 24 (use $\alpha = 0.05$)

25. Obtain the exact confidence interval for mean when variances is known of Normal Population

26. Define Student's t distribution. If X_1 and X_2 are two independent standard normal variables. Prove that $t = \frac{\sqrt{2}\,X_1}{\sqrt{X_1^{\,2} + X_2^{\,2}}}$ follows t distribution with 2 d.f.

27. Describe the paired sample t test

28. Derive mean and variance of chi square distribution

29. If T is an unbiased estimate of μ, check whether T^2 is unbiased for μ^2

(6x5=30 Marks)

Section-D

[Answer *any 3* questions. Each carries 8 marks]

30. If $X_1, X_2, ..., X_n$ is a random sample from a normal population with mean μ and variance σ^2. Obtain the distribution of sample variance.

31. (a) Explain the chi- square test for independence of attribute

(b) From the following table showing the number of plants having certain character. Test the hypothesis that the flower colour is independent of flatness of leaves. (use $\alpha = 0.05$)

Leaves / Flowers	Flat leaves	Curled leaves	Total
White flowers	99	36	135
Red flowers	20	5	25
Total	119	41	160

32. Let x_1, x_2 are two random sample taken from a population with p.d.f $f(x) = \frac{1}{\theta} e^{-\frac{x}{\theta}}$, $0 < x < \infty$, $\theta > 0$. To test $\theta = 2$ against $\theta = 4$, the critical region is $x_1 + x_2 \geq 9.5$. Obtain the significance level and power of the test.

33. (a) Distinguish between point estimation and interval estimation with examples.

(b) Estimate a 95% confidence interval for μ based on 10 random samples 22, 25, 30, 21, 24, 26, 24, 28, 25, 26 taken from $N(\mu, 5)$.

34. Let $X_1, X_2, ..., X_n$ is a random sample from a normal population with mean μ and variance σ^2. Obtain the moment estimators of μ and σ^2.

(3x8=24 Marks)