66

2B3N24118 (Pages : 2) Reg. No:.......................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Statistics Degree Examination, November 2024

BAS3C03 – life Contingencies and Principles of Insurance

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

PART-A (Short Answer)
Each question carries *two* marks. Maximum *20* Marks

1. Define Annual Premium Contract.
2. Define principle of equivalence.
3. What is Life Insurance?
4. What is an Endowment Insurance?
5. Define a Continuous Premium Whole life policy?
6. What are reserves?
7. Define Hull Insurance.
8. Define Travel Insurance.
9. Define the concept of risk peril hazard.
10. What do you mean by pecuniary loss?
11. What is a joint and last survivor policy?
12. Define ULIP?

Maximum Marks = 20

PART-B (Paragraph)
Each question carries *five* marks. Maximum *30* Marks

13. Compare and contrast between Prospective and Retrospective reserves.
14. Explain why general insurance is important in insurance industry.
15. Briefly explain the 7 principles of Insurance
16. Distinguish between Endowment and Whole life Insurance.
17. Prove that the retrospective and prospective reserves are equal at time t for an immediate annuity (payable annually in arrears) of amount B with initial expenses I and renewal expenses of R (incurred at the start of every year except the first year).

18. An annuity of £8,500 *pa* is to be paid monthly in advance for the remaining lifetime of Mrs S, who is currently aged exactly 60. Calculate the single premium that should be paid for this annuity, allowing for initial expenses of 1.5% of the premium and administration expenses payable at the start of each year, including the first. Administration expenses are £120 at the start of Year 1 and increase at the rate of 1.9231% *pa*.
Assume AM92 Select mortality and 6% *pa* interest.
19. Discuss utility theory and its significance in insurance.

Maximum Marks = 30

PART-C

(Answer *any one* Question and each carries 10 marks)

20. A life office sells joint whole life assurances to male lives aged 60 and female lives aged 55 exact. The benefits, payable at the end of the year of death in each case, are £100,000 on the first death and £50,000 on the second death. Level premiums are paid annually in advance while the policy is in force. Calculate the annual premium payable.
Basis: PMA92C20/PFA92C20 mortality, 4% *pa* interest. Ignore expenses.
21. Sam, aged 40, buys a 20-year term assurance with a sum assured of £150,000 payable immediately on death. Calculate the quarterly premium payable by Sam for this policy. Assume that initial expenses are 60% of the total annual premium plus £110, and renewal expenses are £30 *pa* from Year 2 onwards.
Basis: AM92 Select, 4% *pa* interest

(1 x 10 = 10 Marks)

64

2B3N24116 (Pages : 2) Reg. No:......................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Statistics Degree Examination, November 2024

BST3B03 – Statistical Estimation

(2022 Admission onwards)

Time: 2½ hours Max. Marks : 80

Part A
Each question carries 2 marks

1. Define standard error.
2. Give an example to differentiate between parameter and statistic.
3. State the additive property of chi-square distribution.
4. Define student's t statistic and give example.
5. Explain the reciprocal property of F distribution.
6. Define unbiasedness and consistency of an estimator.
7. What is meant by efficiency?
8. State the necessary and sufficient condition for sufficiency.
9. Define maximum likelihood estimation.
10. State the inter-relationship between t, F and χ^2 distributions.
11. Explain the importance of Bayesian estimation method.
12. State the conditions for Cramer-Rao lower bound.
13. Explain point estimation.
14. Define confidence interval.
15. Write the confidence interval for the difference of means of two normal populations when the standard deviations are not same but known.

(Maximum Mark = 25)

Part B

Each question carries 5 marks

16. Obtain the sampling distribution of the sample mean calculated from a normal population.

17. If two independent random samples of sizes 15 and 20 are taken from $N(\mu,\sigma^2)$. What is the probability of $(S_1^2/S_2^2) < 2.5$?

18. If $x_1, x_2, \ldots, x_n$ are independent observations from normal distribution $N(\mu,\sigma^2)$ then find the distributions of (i) $T = \sum_{i=1}^{n}\left(\frac{x_i-\mu}{\sigma}\right)^2$ (ii) $Y = \frac{\bar{x}-\mu}{\sqrt{\sum_{i=1}^{n}(x_i-\mu)^2}}$

19. Show that if σ is known in random sampling from normal distribution, $\bar{x}$ is a sufficient estimator for μ; but if μ is known S^2 is not a sufficient estimator for σ^2.

20. Explain the method of moment estimation and the properties of moment estimators.

21. Show that sample variance is a consistent estimator for the population variance though it is biased, in the case of normal population.

22. Let $x_1, x_2, \ldots, x_n$ be a random sample from the Poisson distribution with parameter θ, where $\theta > 0$. Obtain the maximum likelihood estimator for θ.

23. Obtain the confidence interval for the mean of a normal population $N(\mu, \sigma^2)$.

(Maximum Mark = 35)

Part C

Each question carries 10 marks (Answer any TWO questions)

24. X is a normal variate with mean 42 and standard deviation 4. Find the probability that value taken by $\overline{X}$ is (i) less than 50, (ii) greater than 50, (iii) greater than 40, (iv) in between 40 and 50 and (v) less than or equal to 45.

25. Obtain mean, variance and m.g.f of χ^2 distribution with n degrees of freedom.

26. (a) If t follows t -distribution with n d.f., prove that t^2 follows $F(1, n)$.

    (b) What are the characteristics of F distribution?

27. Find the MLE based on a random sample of size n from $N(\mu, \sigma^2)$ of

    (i) μ when σ is known (ii) σ^2 when μ is known and (iii) both simultaneously.

(2 x 10 = 20 Marks)

2B3N24117 (Pages : 2) Reg. No:........................

Name: ....

65

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Mathematics Degree Examination, November 2024

BST3C03 – Probability Distributions and Sampling Theory

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

SECTION-A

Each question carries 2 Marks.

Maximum Marks that can be scored in this section is 20.

1. Define Pareto distribution and write down its pdf.
2. What is convergence in probability?
3. Distinguish between simple random sampling with replacement and without replacement.
4. Derive the mean of the uniform distribution (discrete).
5. Define an exponential distribution. What is its relationship with the Chi-square distribution?
6. Mention any four properties of the normal distribution.
7. Write down the pdf of the Negative binomial distribution.
8. What is a parameter? Give an example.
9. Define the Poisson distribution. Derive its mgf.
10. A continuous r.v X follows Normal distribution with mean 65 and s.d. 5. Evaluate $P(X>70)$.
11. A r.v X has a uniform distribution over (0,1). Obtain the distribution of $Y = -2 \log_e X$.
12. What do you mean by sampling distribution?

SECTION-B

Each question carries 5 Marks.

Maximum Marks that can be scored in this section is 30.

13. Derive the Poisson distribution as the limiting form of the Binomial distribution.
14. State and prove Bernoulli's law of large numbers.
15. Briefly explain the various methods of sampling.
16. Derive the mgf of the Gamma distribution and hence obtain its mean and variance.
17. Define a t – variate and give its pdf. Derive an example of a statistic that follows t – distribution.

18. If X is the number scored in a throw of a fair die, show that the Tchebycheff inequality gives $P(|X-\mu| > 2.5) < 0.47$, where μ is the mean of X, while the actual probability is zero.

19. Derive the mean and variance of the geometric distribution.

SECTION-C
(Answer *any one* Question and carries 10 marks)

20. a. State and prove weak law of large numbers.

b. Examine whether the weak law of large numbers holds good for the sequence X_n of independent random variables where $P\left(X_n = \frac{1}{\sqrt{n}}\right) = \frac{2}{3}$

and $P\left(X_n = -\frac{1}{\sqrt{n}}\right) = \frac{1}{3}$.

21. Derive the recurrence relation for all the central moments of the Normal distribution.

(1 x 10 = 10 Marks)

60

2B3N24109 (Pages : 2) Reg. No:......................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Psychology Degree Examination, November 2024

BST3C07 – Probability Distributions and Parametric Tests

(2022 Admission onwards)

Time: 2 hours Max. Marks : 60

PART A (SHORT ANSWERS)
Each question carries 2 marks. Maximum 20 marks.

1. Which distribution can be used to model number of success in n independent trials with constant probability of success? Give its p.m.f.
2. A Poisson random variable have a standard deviation of 2. Write down its probability distribution.
3. Define standard normal random variable.
4. What is meant by a sampling frame?
5. What is meant by a strata?
6. Define simple hypothesis.
7. What is meant by level of significance?
8. What is a best test?
9. What is meant by one tailed test?
10. Give the test statistic for the equality of two population means for large sample size mentioning each term.
11. When will we use t test to test the significance of means?
12. Give the test statistics for significance of variance and equality of variances assuming normal populations.

PART B (LONG ANSWERS)
Each question carries 5 marks. Maximum 30 marks.

13. With the usual notations, find 'p' for the binomial variate X, if n = 6 and 9P(X = 4) = P(X = 2).
14. A r.v. X denote the number of defectives follows Poisson distribution with variance 1. Calculate the probability that there will be
    (a) no defectives
    (b) exactly two defective
    (c) at least two defectives.
15. Distinguish between linear and circular systematic sampling.
16. Distinguish between critical value and p- value.
17. A random sample of 36 drinks from a soft drink machine has an average content of 7.4 ounces with a standard deviation of 0.48 ounces. Test the hypothesis $H_0: \mu = 7.5$ ounces against $H_1: \mu < 7.5$ at $\alpha = 0.05$.
18. A candidate at an election claims that he has 80% support from voters. Verify this claim if in a random sample of 400 voters from the locality 300 supported this candidature.
19. A certain stimulus administered on each of 10 patients resulted in the following changes in blood pressure. 5, 2, 8, -1, 3, -2, 1, 5, 4, 6. Can it be concluded that the stimulus will be in general accompanied by a decrease in blood pressure?

PART C (ESSAY)
Answer any one question. Carry 10 marks.

20. For a normal random variable 15% of the observations are below 30 and 10% are above 65. Find the mean and variance.
21. Distinguish between random and non-random sampling. Discuss various methods of non-random sampling.