1B3N16233 (Pages :2) Reg. No:.........................

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2016

AS3C03 - Life Contingencies and Principles of Insurance

(2015 Admission onwards)

Max. Time: 3 hours Max. Marks: 80

PART-A

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

1. The cause that produces loss is known as ....
   a) Hazard b) Peril
   c) Risk d) none of these
2. If ${}_nV_x$=0.080, P_x=0.024 and $P_{x:\overline{n}|}^{\ 1} = 0.2$, then $P_{x:\overline{n}|}^{1}$ = ...
   a) 0.08 b) 0.008
   c) -0.08 d) -0.008
3. The amount of premium payment is determined after an .... principle.
   (a) expected value (b) economic decision (c) equivalence (d) fair value.
4. Premiums are always paid in ....
5. The contingent payment linked to the amount of loss is called ....
6. Write down the form of log utility function.
7. The expected value of random prospects with monetary payments is called .....
8. The amount of money that the insurer sets aside to meet future liabilities is called ......
9. .... is the satisfaction that a consumer gets from a particular course of action.
10. Head office of the Oriental Insurance company is situated in ....
11. Insurance contract related with a deductible amount is known as ......
12. Write down the form of fractional power utility function.

(12 x 1= 12 Marks)

PART-B

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

13 Define pecuniary loss.
14. Define exponential utility function
15. Define prospective reserve
16. What is meant by valuation of the policy?
17. Define net premium.
18. Define Hull insurance
19. Define professional indemnity.
20. Define equivalence principle.
21. Define risk averse.

(7 x 2= 14 Marks)

PART-C

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

22. Distinguish between Life Insurance and General Insurance

23. Consider a multiple decrement model with two causes of decrement, the forces of decrement are given by

$$\mu_x^{(1)}(t) = \frac{t}{100}, t \geq 0$$
$$\mu_x^{(2)}(t) = \frac{1}{100}, t \geq 0$$

Obtain expression for

a) $f_{T,J}(t,j)$ b) $f_T(t)$ c) $f_J(j)$

24. State and prove Jensen's Inequalities

25. Explain fully continuous whole life premium

26. Explain motor insurance.

27. Prove that $P_{x:\overline{n|}} = {}_nP_x + P_{x:\overline{n|}}^{\;1}(1-A_{x+n})$

28. Calculate the annual premium for a term assurance with a term of 10 years to a male aged 30, with a sum assured of Rs.200000, assuming AM92 ultimate mortality and interest of 6% p.a. Assume that the death benefit is payable at the end of the year of death

29. A 10-year term assurance with a sum assured of Rs.600,000 payable at the end of the year of death, is issued to a male aged 30 for a level annual premium of Rs.500. Calculate the prospective reserve at the end of the fifth year, *ie.*, just before the sixth premium has been paid, assuming AM92 Ultimate mortality and 3% *pa* interest

(5 x 6= 30 Marks)

PART-D

Answer any ***three*** questions. Each question carries ***eight*** marks.

30. Explain utility theory.
31. State and explain Thieles differential equation
32. A multiple decrement model with two causes of decrement has forces of decrement given by $\mu_x^{(1)}(t) = 1/(100-x-t)$ and $\mu_x^{(2)}(t) = 2/(100-x-t)$, $t<100-x$.
    If x = 50, obtain expression for
    (i) $f_{T,J}(t,j)$ (ii) $f_T(t)$ (iii) $f_J(j)$ (iv) $f_{J/T}(j/t)$
33. Explain the history of insurance in India.
34. Explain (i) Apportionable premiums. (ii) Optimal insurance

(3 x 8= 24 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2016

ST3B03 - Statistical Estimation

(2015 Admission onwards)

Max. Time: 3 hours Max. Marks: 80

Part A (Answer **ALL** the questions. Each carries **ONE** mark)

Fill in the blanks (Questions 1- 8)

1. The ratio of two sample variances is distributed as ....
2. The square of any standard normal variate follows ....distribution.
3. If t_1 & t_2 are two unbiased estimators such that $V(t_1) = V(t_2)$, then t_1 is ....to t_2.
4. The number of independent observation in a distribution is called ....
5. The 98% confidence interval for the proportion of success of a population using a sample of size 100with sample proportion of success 0.3 is ....
6. The range of t- distribution is ....
7. Standard deviation of the sampling distribution of an estimator is called ....
8. The theory of estimation was founded by.........

Choose the correct answer (Questions 9-12)

9. The relation between the mean and variance of chi-square distribution is
   (a) Mean = 2 Variance (b)2 Mean = Variance
   (c) Mean = Variance(d) None of the above
10. If t is consistent estimator for θ , then
    (a)t is also consistent estimator for θ^2 (b) t^2 is consistent estimator for θ^2
    (c) t^2 is consistent estimator for θ (d)None of the above
11. If $E(t) > \theta$,the parameter value t is said to be
    (a) biased (b)unbiased (c)consistent (d)sufficient
12. Formula for the confidence interval for the ratio of variances of two normal population involves
    (a)chi-square distribution(b)F distribution(c) t distribution(d)None of these

(12 X 1 = 12)

Part B (Answer any **SEVEN** questions. Each carries **TWO** marks.)

13. Define Efficiency with an example..
14. Distinguish between estimate and estimator.
15. Define convergence in probability.
16. Write four properties of mle.
17. State Fisher-Neymman factorization theorem.
18. Give an example of a consistent estimator which is not unbiased.
19. Define statistic and parameter.
20. Write the probability density function of t and F distribution.
21. What do you mean by confidence interval?

(7 X 2 = 14)

Part C (Answer any **SIX** questions. Each carries **FIVE** marks.)

22. Examine whether S^2 is unbiased for σ^2. If not can you suggest an unbiased estimator for σ^2 when $X \rightarrow. N(\mu, \sigma)$.

23 Find m.l.e for Θ of frequency function $f(x, \Theta) = \Theta\, e^{-\Theta X}$,$X > 0$ $\Theta > 0$

24 The mean & s.d of a sample of size 60 are found to be 145 and 40.construct 95% confidence interval for the population mean.

25. Obtain the mgf of chi-square distribution and show that the distribution satisfies additive property.

26. If t is an estimate of a parameter θ,check whether $t^2$is unbiased for θ^2.

27. Estimate parameter p of a Binomial distribution using method of moments

28. State and prove Lindberg-Levy Central limit theorem

29. Explain with suitable example

(a)Consistent estimator

(b)Sufficient estimator

(6 X 5 = 30)

Part D (Answer any **THREE** questions. Each carries **EIGHT** marks.)

30. Let $X_1, X_2, \ldots\ldots\ldots X_n$ is a random sample from a norma population with mean μ and variance σ^2 Obtain the mle of μ and σ^2.

31. Explain point & interval estimation with an example.

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

33. a) State and prove Chebychev's inequality

b)Let X be a random variable taking values -1, 1 with probabilities 1/2 each. Using above inequality find the upper bound of $P(|X| \geq 1)$

34, Describe the method and fit the curve of the form $y = ax^b$ using least square method for the following data.

X :	0.5	1.5	2.5	3.5	4.5
Y :	3.2	9.0	27.6	80.4	250

(3 X 8=24)

Name: ....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Degree Examination, November 2016

ST3C03 - Statistical Inference

(2015 Admission onwards)

Max. Time: 3 hours | Max. Marks: 80

PART A

Answer all 12 questions. Each carries 1 mark.

Fill in the blanks (Questions 1-6)

1. If X and Y are independent standard normal variates, then $V(X^2 + Y^2) =$ -----
2. Random observations 12, 4, 24, 5, 15, 20, 15, 28, 18 are drawn from Uniform (0, θ). The maximum likelihood estimator of θ based on the observations is ------
3. The critical value corresponding to 5% level of significance for one sided hypothesis in large sample tests is ------
4. Equality of variances of two normal populations can be tested by ------ test.
5. The statistical test used for testing the significance of population correlation coefficient is -----
6. Chi-square test of goodness of fit was introduced by --------

Choose the correct answer (Questions 7-12)

7. Mean of student's t distribution with n degrees of freedom is
   (a) n (b) $2n$ (c) 0 (d) 1
8. Which property of an estimator is most desirable?
   (a) Unbiasedness (b) Consistency (c) Efficiency (d) Sufficiency
9. Estimator of variance of normal population obtained by the method of moments is -----------estimator of population variance
   (a) Unbiased (b) Consistent (c) Unbiased and consistent both (d) None of the above
10. Power of a test is related to
    (a) Type I error (b) Type II error (c) Type I and II errors both (d) None of these
11. Degrees of freedom for chi-square in case of contingency table of order $5 X 4$ are----
    (a) 9 (b) 20 (c) 12 (d) 19
12. The 99% shortest confidence interval for μ in $N(\mu, \sigma^2)$ when $\sigma^2 = 4$ based on random sample of 100 observations with mean 64 is
    (a) (63.484, 64.516) (b) (63.608, 64.392) (c) (63.671, 64.671) (d) (63.50, 64.50)

Answer any 7 questions. Each question carries 2 marks

13. Define chi-square distribution. Find its moment generating function.
14. What is sufficient statistic? State factorization theorem on sufficiency.
15. Define (i) null and alternative hypotheses and (ii) size of a test.
16. A coin was tossed 400 times and head turned up 216 times. Test the hypothesis that the coin is unbiased.
17. Find an unbiased estimator of $e^{-\lambda}$ in Poisson (λ) distribution
18. Show that Max $\left(X_{1,}\ X_{2,} \dots, X_n\right)$ is sufficient for estimating the parameter θ in Uniform (0, θ) distribution
19. Show that if F follows $F(m, n)$, then $\frac{1}{F}$ follows $F(n, m)$
20. Find $100(1-\alpha)$ % shortest confidence interval of variance of normal population
21. Define MP test and state Neyman-Pearson lemma.

(7x 2 = 14 marks)

PART C

Answer any 6 questions. Each question carries 5 marks

22. (i) What are two kinds of errors in testing a statistical hypothesis?

    (ii) A population has the probability density function f(x) = $\frac{1}{4}$, θ -2 ≤ X ≤ θ + 2 and zero otherwise. To test the null hypothesis θ = 5 against the alternative hypothesis θ = 8 based on a sample of size one, say x. It is suggested to reject the hypothesis if x ≥ 6. Find the power of the test.
23. Define t and F distributions. Establish the relation between t and F distributions
24. Derive the sufficient conditions for consistency of an estimator.
25. Find the maximum likelihood estimator of the parameter θ of the following distribution

    $f(x) = \frac{1}{2} e^{-|x-\theta|}, -\infty < x < \infty$ and $-\infty < \theta < \infty$.
26. Define interval estimation. Obtain the interval estimate of proportion of binomial population.
27. Stating the assumptions, describe student's t- test for paired samples.
28. Obtain chi-square statistic for a 2 X 2 contingency table under the independence of attributes.
29. Examine whether $\frac{1}{n} \sum(X-\bar{X})^2$ is unbiased and consistent estimator of σ^2 in

PART D

Answer any 3 questions. Each question carries 8 marks

30. Explain the method of moments for estimating the parameters of a population. Estimate the parameters θ_1 and θ_2 of the following population with pdf by the method of moments

$$f(x) = \frac{1}{B(\theta_1,\theta_2)} x^{\theta_1-1}(1-x)^{\theta_2-1}, 0 \leq x \leq 1, \theta_1, \theta_2 > 0$$

31. (i) Explain the large sample test for testing the equality of population proportions

(ii) In a sample of 600 men taken from a big city 400 are found to be smokers. In another sample of 900 men taking from another city 450 are smokers. Do the data indicate that there is a significant difference in the habit of smoking in the two cities? Use 5% level of significance.

32. (i) Given the sample values 4.5, 6.5, 3.8, 4.2, 7.7, 8.5, 9.4, 5.3, 3.9 from a normal distribution with mean μ and variance 4. Find the best critical region at 5% level of significance for testing $H_0: \mu = 4$ against $H_1: \mu = 5$.

(ii) Give the procedure for testing the equality of two normal population means based on independent samples when population variances are equal and unknown.

33. (i) Explain the principle of maximum likelihood estimation.

(ii) Prove that the maximum likelihood estimator of the parameter θ of a population having pdf $(x) = \frac{2}{\theta^2}(\theta - x), 0 < x < \theta$ for a sample of size one is $2x$, x being the sample value. Show that the estimator is biased.

34. (i) Obtain 95 % confidence limits for the parameter μ in $N(\mu, \sigma^2)$ when σ^2 is unknown.

(ii) Explain chi-square test of goodness of fit.

(iii) Explain the concept of efficiency in estimation theory

(3 x 8 = 24 marks)