

1B3N20219

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Reg. No:.....

Name: .....

FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

**Third Semester B.Sc Psychology Degree Examination, November 2020****BST3C07 – Probability Distributions and Parametric Tests**

(2019 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 Bernoulli distribution
2. Find the probability that no defective fuse will be found in a box of 200 fuses, past experience shows that 2% of such fuses are defective.
3. What are the assumptions of Central Limit theorem?
4. What is meant by random sample?
5. In what situation sampling is inevitable?
6. Distinguish between a stratum and a cluster.
7. What do you understand by standard error?
8. What is p-value?
9. Define critical value.
10. A sample of 900 members has a mean 3.4 cms and s.d.2.61 cms. Is the sample from a large population of mean 3.25 cms and s.d. 2.61cms?
11. The mean life of 100 fluorescent light tubes produced by a company is computed to be 1570 hours with sd of 120 hours. The company claims that the average life of the tubes produced by the company is 1600 hours. Using the level of significance of 0.05, is the claim is acceptable?
12. Define chi square test for population variance.

**SECTION-B**

**Each question carries 5 Marks.**

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

13. If the mean and variance of a binomial distribution are 4 and 2 respectively. Find the probability of
- Exactly two successes.
  - Less than two successes.
  - More than two successes.
  - At least two successes.
14. The mean yield for one-acre plot is 662 kilos with a S.D.32 kilos. Assuming normal distribution, how many one-acre plots in a batch of 1000 plots would you expect to have yield
- Over 700 kilos,
  - below 650 kilos, and
  - Between 660 and 710 kilos.
15. What are the advantages of sampling over census?
16. Explain systematic sampling. Discuss its advantages and disadvantages.
17. a) Define and elaborate two types of errors in testing of hypotheses.  
b) Define null and alternative hypothesis and give suitable examples.
18. In a survey of buying habits, 400 women shoppers are chosen at random in super market 'A' located in a certain section of the city. Their average weekly food expenditure is Rs. 250 with a standard deviation of Rs. 40. For 400 women shoppers chosen at random in super market 'B' in another section of the city. The average weekly food expenditure is Rs. 220 with a standard deviation of Rs. 55. Test at 1% level of significance whether the average weekly food expenditure of the two populations of shoppers are equal.

19. a) Explain paired-t test.

b) Ten subjects were tested on an attitude scale. Then, they were made to read some literature in order to bring a change in their attitudes. The attitude scale was re-administered. The results of the initial and final testing are as under:

Initial	10	9	9	8	8	7	7	5	4	4
Final	11	7	8	9	6	6	8	4	3	4

Test the hypothesis that the differences of the scores are normally distributed.

### SECTION-C

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

20. Fit a Poisson distribution to the following data and calculate the theoretical frequencies.

No. of Accidents	0	1	2	3	4	5
No. of men	142	156	69	27	5	1

21. Explain the procedure of stratified random sampling. Describe its merits and demerits.

(1 x 10 = 10 Marks)

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
Third Semester B.Sc Degree Examination, November 2020  
BST3B03 – Statistical Estimation  
(2019 Admission onwards)

Time: 2½ hours

Max. Marks : 80

**SECTION-A****Each question carries 2 Marks.****Maximum Marks that can be scored in this section is 25.**

1. Define continuous uniform or rectangular distribution. Why this distribution named as rectangular ?
2. What are the properties of exponential distribution?
3. Define Normal distribution.
4. Define lognormal distribution.
5. State central limit theorem.
6. What are the properties of chi square distribution?
7. What is the difference between parameter and statistic?
8. What are the properties of student's t- distribution?
9. What are the desirable properties of good estimator?
10. Write the sufficient conditions for consistency.
11. State Fisher-Neyman factorization theorem.
12. Write the confidence interval for difference of two population means in the case of large sample.
13. Write the confidence interval for population variance.
14. Explain beta distribution of first kind.
15. Mention any four properties of rectangular distribution.



### SECTION-B

Each question carries 5 Marks.

Maximum Marks that can be scored in this section is 35.

16. Derive the mean and variance of continuous uniform distribution
17. A resistor  $R$  is a random variable which is uniformly distributed between  $900 \Omega$  and  $1100 \Omega$ . Determine the probability that  $R$  is between  $950 \Omega$  and  $1050 \Omega$  and derive the mean.
18. Derive the mgf of exponential distribution
19. Prove that for a normal distribution, the quartile deviation, mean deviation and standard deviation are approximately 10:12:15
20. State and prove central limit theorem
21. Show  $t_n = \frac{n\bar{x}}{n+1}$  is a consistent estimator of  $\lambda$  where  $\bar{x}$  is the mean of samples of size 'n' taken from a poisson population
22. Derive the confidence interval for population mean in the case of large sample
23. Derive the confidence interval for ratio of two population variances

### SECTION-C

(Answer any two Questions and each carries 10 marks)

24. A random sample of size 'n' is taken from a gamma distribution with parameters  $\alpha$  and  $\beta$ . Show that the sample mean also follows a gamma distribution with parameters  $n\alpha$  and  $n\beta$ .
25. In a test on 2000 electric bulbs, it was found that the life of a particular make was normally distributed with an average life of 2040 hours and SD of 60 hours. Estimate the number of bulbs likely to burn for
  - (i) more than 2150 hours
  - (ii) less than 1950 hours
  - (iii) more than 1920 hours and but less than 2160 hours
26. If 8.6, 7.9, 8.3, 6.4, 8.4, 9.8, 7.2, 7.8, 7.5 are the observed values of a random sample of size 9 from a distribution  $N(\mu, \sigma^2)$ . Construct a 90% confidence interval for  $\mu$  and  $\sigma^2$
27. Suppose  $x_1, x_2, \dots, x_n$  are iid with pdf  $f(x) = \frac{2x}{\theta^2}, 0 < x < \theta, \theta > 0$ 
  - (i) find MLE of  $\theta$
  - (ii) find MLE for median of distribution

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE

Third Semester B.Sc Mathematics Degree Examination, November 2020

BST3C03 – Probability Distributions and Sampling Theory

(2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

**Part A****Each question carries 2 Marks.****Maximum Marks that can be scored in this Part is 20**

1. Find the mean and variance of a binomial distribution with parameters (10,0.4).
2. Define Cauchy distribution.
3. State the lack of memory property of geometric distribution.
4. State Bernoulli law of large numbers.
5. What are the assumptions of Central Limit Theorem (CLT)?
6. Define convergence in distribution.
7. Distinguish between census and sample surveys. Give examples.
8. Define simple random sampling.
9. What are the advantages of simple random sampling?
10. State and prove the reproductive property of chisquare distribution.
11. Define F statistic and write down its probability density function.
12. What is sampling distribution?

**Part B****Each question carries 5 Marks.****Maximum Marks that can be scored in this Part is 30**

13. Find the mean and variance of geometric distribution?
14. Find the mode of Binomial distribution?
15. State and prove weak law of large numbers.
16. State Central Limit Theorem and write the applications of CLT.
17. Explain Lottery method.
18. Explain the method of stratified random sampling.
19. What is the relation between t and F?

**Part C**

**Answer any one question and carries 10 Marks.**

20. (a) Define standard normal distribution.  
(b) State and prove limiting relation between Binomial and Poisson distribution.

21. State and prove Chebyshev's inequality. For a random variable with p.d.f.

$f(x) = e^{-x}; x \geq 0$ , Use Chebyshev's inequality to find  $P(|X - 1| \geq 2)$ ?

**(1 x 10 = 10 Marks)**

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FAROOK COLLEGE (AUTONOMOUS), KOZHIKODE  
**Third Semester B.Sc Degree Examination, November 2020**  
**BAS3C03 – Life Contingencies and Principles of Insurance**  
 (2019 Admission onwards)

Time: 2 hours

Max. Marks : 60

**PART –A(Short Answers)**  
**(Each question carries two marks. Maximum 20 Marks)**

1. Define equivalence principle.
2. What is meant by pure premium?
3. What is the difference of whole life annuity premium from other life insurance premiums?
4. Find  $P_{x:\overline{n}|}^1$ , if  ${}_nV_x = 0.080$ ,  $P_x = 0.024$ .
5. Define retrospective reserve.
6. Calculate  ${}_{20}V_{45}$  given that  $P_{45} = 0.014$ ,  $P_{45:20|} = 0.030$  and  $P_{45:20|}^1 = 0.022$
7. Distinguish between peril and hazard.
8. What do you mean by indemnity?
9. Define Aviation insurance.
10. Define exponential utility function
11. Define expected utility theorem.
12. An insurer whose current wealth is  $w$ , uses the utility function  $u(x) = x - \frac{x^2}{2\beta}$  where  $x < \beta$ , for decision making purposes. Show that the insurer is risk averse.

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

13. Explain fully continuous premium under n-year endowment insurance.
14. Prove that  $P_{x:\overline{n}|} = {}_nP_x + P_{x:\overline{n}|}^1(1 - A_{x+n})$
15. Derive and explain premium difference formula and paid up insurance formula for fully continuous benefit reserves.(derive for at least 2 types of insurances.)



16. Explain why the insurer holds reserve?
17. What are the features of a contract?
18. What do you mean by a risk averse investor? Explain the characteristics of utility function of this investor.
19. Briefly explain various utility functions.

**PART -C**

**Answer any one question and carries 10 Marks.**

20. a) Explain fully continuous Premium under n-year endowment insurance.  
b) Express the variance of the loss  $L$ , associated with an n-year endowment insurance, in terms of actuarial present value.
21. Explain fully continuous benefit reserve under n-year deferred whole life annuity.

**(1 x 10 = 10 Marks)**