QP CODE: 25024579

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Reg No : .....

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M.Sc DEGREE (CSS) EXAMINATION, APRIL 2025

Fourth Semester

M Sc BIOSTATISTICS

CORE - ST020401 - SAS PROGRAMMING,BAYESIAN INFERENCE AND MCMC METHODS

2019 ADMISSION ONWARDS

0A52F410

Time: 3 Hours Weightage: 30

Part A (Short Answer Questions)

*Answer any **eight** questions.*

*Weight **1** each.*

1. Write a SAS program for drawing histogram of a given data.
2. Explain CLASS and DROP statements in SAS.
3. Define UNIVARIATE and SORT statements.
4. Explain frequentist approach to probability.
5. Show that the Poisson distribution belongs to the one parameter exponential family.
6. Explain entropy loss function.
7. Discuss on Bayesian interval estimation.
8. Explain Lindley's paradox.
9. What is meant by importance sampling?
10. What is MCMC technique?

(8×1=8 weightage)

Part B (Short Essay/Problems)

*Answer any **six** questions.*

*Weight **2** each.*

11. Write down the SAS program for developing frequency curve and histogram of a data.
12. Write down the SAS program for simulating 100 random variables from exponential population with mean $\frac{1}{5}$
13. Show that Beta distribution is a conjugate prior family for binomial and negative binomial parameter p.

14. Show that normal distribution is a conjugate family for normal parameter μ in $N(\mu, \sigma^2)$ when σ^2 is known.

15. Discuss on 0-1 loss, quadratic error loss and absolute error loss and corresponding Bayes estimates.

16. Derive the Bayes estimator of p in a Binomial population under SELF using a non informative uniform prior distribution over (0,1).

17. Describe how you will generate random variables from a symmetric Laplace distribution with pdf $f(x) = \frac{1}{2\sigma} e^{-\frac{|x|}{\sigma}} \quad -\infty < x < \infty$

18. Explain the various steps for applying EM algorithm.

(6×2=12 weightage)

Part C (Essay Type Questions)

*Answer any **two** questions.*

*Weight **5** each.*

19. (a) Describe OUTPUT and LABEL statements in SAS with an example (b) Discuss on CORR,PLOT,REG statements in SAS.

20. a) The chances of A,B,C becoming the finance minister of a state are 4:2:3 . The probability that a health insurance scheme will be introduced by them are 0.3,0.5 and 0.8. What is the probability that the insurance scheme is introduced? What is the probability that A became the finance minister given that the health insurance scheme is implemented?
    b) Find the posterior distribution of μ in $N(\mu, \sigma^2)$ if σ^2 is known and the prior distribution is taken as N(0,1).

21. a)Distinguish between classical testing and Bayesian testing of hypothesis.
    b) Illustrate it with an example

22. a) Explain Monte Carlo Sampling to estimate an integral.
    b) Describe how you will find its standard error.
    c) Discuss the role of importance sampling in this context.

(2×5=10 weightage)