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[189/220]

Sardar Patel University
External Examination
M.Sc. Statistics/M.Sc. Applied Statistics Semester III
PS03ESTA22/PS03EAST22: Generalized Linear Models
October 29, 2018, Monday

Time: 02:00 p.m. to 5:00 p.m.   Marks:70

Q1.   **Multiple Choice Questions.**   08

(i)   _____ link function is not symmetric.

     (a) complementary log log (b) probit (c) logit (d) all of them

(ii)   If all estimated coefficients of linear predictor are non negative in model with constant CV,

     then _____ link function is an appropriate.

     (a) log (b) identity (c) inverse (d) logit

(iii)   Generalized Linear Model is a class of statistical models that is a natural generalization of

     _____.

     (a) Probit Model (b) Logistic Model (c) Nonlinear Model (d) Classical Regression Model

(iv)   Retrospective study is also known as_____.

     (a) backward study (b) follow up study

     (c) cohort study (d) study of exposure to incidence of disease

(v)   The form of deviance for the inverse Gaussian distribution is

     (a) $\sum (y - \hat{\mu})^2$ (b) $\sum \frac{(y-\hat{\mu})^2}{\hat{\mu}^2}$ (c) $\sum \frac{(y-\hat{\mu})^2}{\hat{\mu}^2 y}$ (d) none of them

(vi)   To model the polytomous ordinal response _____ model is suitable.

     (a) parallel regression (b) cumulative logit model (c) cumulative probit model (d) all of them

(vii)   For comparison of two nested (non-nested) model, which of the following criteria is

     considered to be best?

     (a) Deviance (b) AIC (c) BIC (d) both (b) and (c)

(viii)   The form of weight matrix in Poisson regression is given by

     (a) $\log \mu$ (b) $\frac{1}{\mu}$ (c) μ (d) none of them

Q2.   **Short Answer Type Question (Any Seven)**   14

1. Define log linear model. Further, give its application.

2. What do you mean by over dispersion? Further, write what effect we observe on estimates and its confidence interval of parameters under the presence of it?

3. Distinguish between prospective study and retrospective study.

4. Give the form of adjusted dependent variable and weight matrix when response follows gamma distribution.

5. In usual notations, shows that binomial distribution is a member of exponential family of

(P.T.O.)

distribution.

6. Give form of cumulative logit model for ordinal response. Further, what kind of relations exists between all intercept parameters of the model?

7. Give the form of base line category model. Further give its application.

8. Give the form of linear predictor having three variables containing two covariates age, income and one factor gender.

9. In usual notation, derive the variance of adjusted dependent variable.

Q3(a) In usual notation, derive the mean and variance of exponential family of distribution. Further, obtain its form for binomial, negative binomial and Poisson distribution.   06

(b) Discuss the steps for fitting Generalized Linear Models.   06

[OR]

(b) Discuss the justification procedure to obtain the form of adjusted depend variable and correspond weight matrix for fitting Generalized Linear Models.   06

Q4(a) Discuss estimation and testing procedure in binary logistic regression.   06

(b) Discuss Anscombe residuals. Further obtain its form for gamma, Poisson and inverse Gaussian distribution.   06

[OR]

(b) Discuss methods to detect influential points in binary logistic regression.   06

Q5(a) Define deviance. Further, obtain its form for binomial, Poisson and gamma distribution.

(b) Discuss any one model for polytomous response.   06

[OR]

(b) What is the need of parallel regression in generalized linear models? Further, discuss it in details.   06

Q6(a) Discuss Poisson regression for rates.   06

(b) Explain the model in detail for modelling claim size of vehicle insurance.   06

[OR]

(b) Write brief about quasi likelihood approach for estimating parameters of Generalized Linear Models. Further obtain its form for gamma and Poisson distribution.   06