18P165 (Pages: 2) Name: …….

Reg. No……...

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018

(Regular/Supplementary/Improvement)

(CUCSS-PG)

CC15P ST1 C04 – REGRESSION AND LINEAR PROGRAMMING

(Statistics)

(2015 Admission onwards)

Time: Three Hours Maximum: 36 Weightage

PART A

Answer ***all*** questions**.** Each question carries 1 weightage.

1. Explain Gauss- Markov linear model.
2. Consider the linear model $\mathbf{Y} = \mathbf{X\beta} + \boldsymbol{\varepsilon}$. Show that $\boldsymbol{\lambda}^{\mathbf{T}}\boldsymbol{\beta}$ is estimable if and only if $\boldsymbol{\lambda} \in \mathbf{R}(\mathbf{X})$
3. Explain the method of testing the significance of simple linear regression using t test.
4. Explain link function. What is meant by canonical link?
5. Distinguish between standardized and Studentized residuals.
6. Explain logistic regression models.
7. Explain the various steps involved in solving LPP by graphical method.
8. Differentiate between slack and surplus variables.
9. Explain the concept of duality and its uses in LPP.
10. Prove that dual of dual is primal.
11. What is an unbounded assignment problem?
12. Define a saddle point. Is it necessary that a game should always possess a saddle point?

(12 x 1 = 12 Weightage)

PART B

Answer any ***eight*** questions. Each question carries 2 weightage.

13. Consider the simple linear regression model $y_i = \beta_0 + \beta_1 x_i + \epsilon_i$. Derive the means and variances of the least square estimates of β_0 and β_1
14. Establish Gauss Markov theorem.
15. Explain the application of orthogonal polynomials.
16. Discuss Poisson regression model and fit the model using the method of maximum likelihood.
17. Consider the multiple linear regression model $y = \beta_0 + \beta_1 x_1 + \cdots + \beta_n x_n + \epsilon$ where $\epsilon \sim N(0,\ \sigma^2)$. Prove that residual mean square is an unbiased estimator of σ^2.
18. What is over dispersion?
19. Solve the following LPP

    Maximize $Z = 4X_1 + X_2 + 4X_3 + 5X_4$ subject to the constraints:

    $4X_1 - 6X_2 - 5X_3 + 4X_4 \geq -20$

    $3X_1 - 2X_2 + 4X_3 + X_4 \leq 10$

    $8X_1 - 3X_2 + 3X_3 + 2X_4 \leq 20$

    $X_1,\ X_2,\ X_3,\ X_4 \geq 0$

20. Explain LP model. Also give the guidelines on linear programming problem.
21. A company management and the labor union are negotiating a new three year settlement. Each of these has 4 strategies
    I. Hard and aggressive bargaining
    II. Reasoning and logical approach
    III. Legalistic strategy
    IV. Conciliatory approach

    The costs to the company are given for every pair of strategy choice.

Union strategies	Company strategies			
	I	II	III	IV
1	20	15	12	35
2	25	14	8	10
3	40	2	10	5
4	-5	4	11	0

    Find the assignment of union strategies to various company strategies which yield maximum Profit.
22. Explain simplex algorithm. Why this method is called iterative method?
23. "Hungarian method is one of the important methods of assignment problem". Explain Hungarian method.
24. Prove "Dual of a dual of the given primal is the primal".

(8 x 2 = 16 Weightage)

PART C

Answer any ***two*** questions. Each question carries 4 weightage.

25. Explain different methods for diagnosing violation of the basic regression assumptions.
26. Distinguish between multiple regression and logistic regression models. Estimate the parameters of logistic regression model.
27. a) "The penalty will be designed by –M for a maximization problem and +M for a minimization, where M > 0". Identify the method and also its algorithm.

    b) Solve the linear programming problem:

    Maximize $Z = 5X_1 + 3X_2$ Subject to the constraints:

    $$2X_1 + 4X_2 \leq 12$$
    $$2X_1 + 2X_2 = 10$$
    $$5X_1 + 2X_2 \geq 10$$
    $$X_1, X_2 \geq 0$$

28. Discuss the various steps involved in computing the optimum basic feasible solution to a transportation problem.

(2 x 4 = 8 Weightage)

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