**15P156** Name…….

Reg. No……..

**FIRST SEMESTER M.Sc. DEGREE EXTERNAL EXAMINATION FEB. 2016**

(2015 Admissions)

**CC15P ST1 C04: Regression and Linear programming**

(STATISTICS)

**Time: 3 hrs.** **Maximum Weightage: 36**

**Part A**

**(Answer *all* questions. Weightage 1 for each question)**

1. Define simple linear regression model and state least square estimates of the coefficients involved.
2. Define Residual and coefficient of determination $R^2$.
3. Explain Generalised linear model.
4. Define multiple linear regression model. State basic assumptions.
5. What is link function and linear predictors in Generalised linear model.
6. Define orthogonal polynomial.
7. Define LPP, feasible solution and basic feasible solution of LPP.
8. Compute the dual of the following problem.
   Maximize $Z = 3x_1+2x_2 +3x_3$ subject to the constrains
   $-2x_1+x_2-x_3 \leq 4$, $2x_1 + x_2 + x_3 \leq 7$, $x_1+x_2- x_3 \leq 5$; and $x_1, x_2, x_3 \geq 0$
9. Explain assignment problem.
10. Explain Vogel's approximation method for finding initial solution of a transportation problem .
11. Discuss the role of sensitivity analysis in linear programming problem.
12. Explain Dominance property in game theory.

**(12 x 1=12 weightage)**

**Part B**

**(Answer any *eight* questions. Weightage 2 for each question)**

13. Define logistic regression model. Explain the parameter estimation in a logistic regression model.
14. Explain different methods for scaling residuals.
15. Develop confidence interval for the parameter slope for a simple linear regression model
16. Define polynomial regression model. Explain important consideration that arises when fitting a polynomial in one variable.
17. Explain residual plots and indicate its use in respect of
    a) Normality assumption. b) Constant variance.
18. Explain Poisson regression models.
19. Discuss LPP with unrestricted variables and explain the simplex algorithm for solving LPP.
20. Explain how the dual and primal are related. Show that dual of the dual is primal..

21. Solve following LPP
    Max Z = $4x_1+3x_2$ subject to $x_1+x_2 \leq 50$ , $x_1+2x_2 \geq 80$ , $3x_1+2x_2 \geq 140$ $x_1, x_2 \geq 0$. Obtain the variation in constant $b_i$ (i =1,2,3) which are permitted without changing the optimal solution.
22. Explain (i) plot of residual against the regression
    (ii) partial residual plot
23. Using Big-M method solve following LPP
    max $Z=3x_1+2x_2$ subject to $2x_1+x_2 \leq 2$ , $3x_1+4x_2 \geq 12$ , $x_1, x_2 \geq 0$
24. Solve the following 2 x 3 game graphically

| | Player B | | |
|---|---|---|---|
| Player A | 1 | 3 | 11 |
| | 8 | 5 | 2 |

**(8 x 2=16 weightage)**

## Part C

**(Answer any *two* questions. Weightage 4 for each question)**

25. For the linear model $Y_1= 2\beta_1+3\beta_2+e_1$, $Y_2= 3\beta_1+4\beta_2+e_2$ , $Y_3= 4\beta_1+5\beta_2+e_3$
    (i)find all estimable functions and their best estimate
    (ii)check whether $\beta= \begin{vmatrix} \beta_1 & \beta_2 \end{vmatrix}$ estimable
26. Write short note on
    i. Model adequacy checking
    ii. Lack of fit of the regression model
    iii. Generalized least squares
    iv. PRESS statistics
27. Use revised simplex method to solve the LPP
    Max $Z= 3x_1+2x_2+5X_3$ subject to the constraints $x_1+2x_2+x_3 \leq 430$, $3x_1+2x_3 \leq 460$ , $x_1, x_2, x_3 \geq 0$
28. A steal company has 3 furnaces and 5 rolling mills. The transportation cost for shipping steal from furnaces to rolling mill in rupees are given in the following table

| | $M_1$ | $M_2$ | $M_3$ | $M_4$ | $M_5$ | supply |
|---|---|---|---|---|---|---|
| $F_1$ | 4 | 2 | 3 | 2 | 6 | 8 |
| $F_2$ | 6 | 4 | 5 | 2 | 1 | 12 |
| $F_3$ | 6 | 5 | 4 | 7 | 7 | 14 |
| Demand | 4 | 4 | 6 | 8 | 8 | |

Find optimum shipping schedule.

**(2 x 4=8 weightage)**

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