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D 72915 (Pages : 3) Name.....................................

Reg. No..................................

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, DECEMBER 2014

(CUCSS)

Statistics

ST IC 04—REGRESSION AND LINEAR PROGRAMMING

(2013 Admissions)

Time : Three Hours Maximum : 36 Weightage

Part A

Answer **all** *questions. Weightage* 1 *each.*

1. Prove that intersection of any two subspaces S and T of a vector space V is a subspace of V.
2. Examine the linear independence or dependence of the vectors $\{[3\ 2\ 4], [1\ 0\ 2], [1\ -1\ -1]\}$.
3. Define the feasible region of LPP and show that the feasible region is a convex set.
4. Solve the following problem graphically :

   Maximize $Z = 60\,x_1 + 90\,x_2$

   subject to $x_1 + 2x_2 \le 40$

   $2x_1 + 3x_2 \le 90$

   $x_1 - x_2 \ge 10$

   $x_1, x_2 \ge 0$
5. Define feasible solution, basic feasible solution and non-degenerate basic feasible solution of a LPP.
6. Distinguish between degeneracy and cycling in a LPP. Give an example.
7. Explain the concept of duality and its uses in LPP.
8. Write a short note on post optimal sensitivity analysis.
9. What is integer programming ? Explain the merits and demerits of 'rounding off' a continuous optimal solution to a LPP to obtain an integer solution.
10. Define an assignment problem. Can it be considered as a particular case of a transportation problem ? If so, give reasons.
11. What is symmetric game ? Show that the value of a symmetric game is zero.
12. Explain travelling salesman problem.

(12 × 1 = 12 weightage)

Turn over

Part B

Answer any **eight** *questions.*
Weightage 2 each.

13. Examine whether the following set of vectors constitute a basis of V_3 $\{[1-1\,0],[3\,0\,0],[0\,2\,1]\}$.
14. If the subspaces $S_1, S_2, \ldots S_k$ are orthogonal to one another then $S_1 + S_2 + \ldots + S_k$ is direct.
15. Define the inner product on a vector space V over F. In any inner product space, prove th $\langle x, \beta_1 y_1 + \beta_2 y_2\rangle = \bar{\beta}_1 \langle x, y_1\rangle + \bar{\beta}_2 \langle x, y_2\rangle$.
16. Explain the simplex procedure in solving an LPP.
17. Solve the following LPP using simplex method :

    Minimize $Z = 10x_1 + 6x_2 + 2x_3$

    subject to $-x_1 + x_2 + x_3 \geq 1$
    $3x_1 + x_2 - x_3 \geq 2$
    $x_1, x_2, x_3 \geq 0$
18. Explain revised simplex method.
19. Prove that the dual of the dual of a given primal is again primal.
20. Use duality to solve the following LPP :

    Maximize $Z = 2x_1 + x_2$

    subject to $x_1 + 2x_2 \leq 10$.
    $x_1 + x_2 \leq 6$
    $x_1 - x_2 \leq 2$
    $x_1 - 2x_2 \leq 1$
    $x_1, x_2 \geq 0$
21. Explain any Gomory's method of solving an integer programming problem.
22. Prove that the number of basic variables in a transportation problem are almost $m + n - 1$, w m is number of origins and n is number of destinations.
23. Describe the Hungarian method of solving an assignment problem.
24. Explain the theory of dominance in the solution of rectangular games. Illustrate with exam

(8 × 2 = 16 wiehg

Part C

Answer any **two** *questions. Weightage 4 each.*

25. Define basis of vector space. If $A \subseteq S$ where S is a subspace of a vector space V, then shov following statements are equivalent :

(i) A is a minimal generating set of S.

(ii) Every element of S can be expressed uniquely as a linear combination from A,

(iii) A generates S and A is linearly independent.

(iv) A is maximal linearly independent subset of S.

26. Use revised simplex method to solve the following LPP :

Maximize $Z = 6x_1 - 2x_2 + 3x_3$

subject to $2x_1 - x_2 + 2x_3 \leq 2$

$x_1 + 4x_3 \leq 4$

$x_1, x_2, x_3 \geq 0$

27. Solve the following integer programming problem optimally :

Maximize $Z = 8x_1 + 6x_2$

subject to $8x_1 + 4x_2 \leq 85$

$3x_1 + 6x_2 \leq 95$

$x_1, x_2 \geq 0$ and integers.

28. Find the optimum solution to the following transportation problem :

	To						
From	9	12	9	6	9	10	5
	7	3	7	7	5	5	6
	6	5	9	11	3	11	2
	6	8	11	2	2	10	9
	4	4	6	2	4	2	22

(2 × 4 = 8 weightage)