STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI 600 086
(For candidates admitted from the academic year 2004-05 & thereafter)

SUBJECT CODE : MT/AO/LP43

B. Sc. DEGREE EXAMINATION, APRIL 2007
BRANCH I - MATHEMATICS
FOURTH SEMESTER

COURSE : ALLIED OPTIONAL
PAPER : LINEAR PROGRAMMING
TIME : 3 HOURS **MAX. MARKS : 100**

SECTION – A

ANSWER ALL QUESTIONS : **(10 x 2 = 20)**

1. What is the general Linear programming problem ?
2. Define: feasible solution to a linear programming problem.
3. What are surplus variables?
4. Explain Redundancy in constraint equations.
5. Write the dual of Maximize $z = 3x_1 + 2x_2 + x_3$

   Subject to $4x_1 + 5x_2 + 6x_3 \le 2$

   $x_1 + x_2 + x_3 \le 5$

   $x_1, x_2, x_3 \ge 0$
6. State the fundamental Duality theorem.
7. Enumerate any two correspondence rules between primal and dual problems.
8. What is the advantage of the dual simplex algorithm ?
9. What are mixed integer programming problems ?
10. Explain the importance of integer programming.

SECTION – B

ANSWER ANY FIVE QUESTIONS: **(5 x 8 = 40)**

11. Find all the basic solutions of the system

    $x_1 + 2x_2 + x_3 = 4$

    $2x_1 + x_2 + 5x_3 = 5$
12. Solve graphically :

    Maximize $z = 3x_1 + 2x_2$

    subject to $x_1 + x_2 \le 4$

    $x_1 - x_2 \le 2$

    $x_1, x_2 \ge 0$
13. Using the simplex method solve:

    Maximize $z = 3x_1 + 2x_2 + 5x_3$

    subject to $x_1 + 2x_2 + x_3 \le 430$

    $3x_1 + 2x_3 \le 460$

    $x_1 + 4x_2 \le 420$

    $x_1, x_2, x_3 \ge 0$
14. Solve by the Big M-Method

    Minimize $z = 12x_1 + 20x_2$

    subject to $6x_1 + 8x_2 \ge 100$

    $7x_1 + 12x_2 \ge 120$

    $x_1, x_2 \ge 0$

15. Solve using the simplex method.

Minimize $z = x_1 - 2x_2 - 3x_3$

subject to $-2x_1 + x_2 + 3x_3 = 2$

$2x_1 + 3x_2 + 4x_3 = 1$

$x_1, x_2, x_3 \geq 0$

16. Show that the dual of the dual is the primal.

17. Using the dual simplex method solve:

Maximize $z = -3x_1 - x_2$

subject to $x_1 + x_2 \geq 1$

$2x_1 + 3x_2 \geq 2$

$x_1, x_2 \geq 0$

SECTION – C

ANSWER ANY TWO QUESTIONS: (2 x 20 = 40)

18. A firm manufactures two types of products A and B and sells them at a profit of Rs.2.00 on type A and Rs.3.00 on type B. Each product is processed on two machines M_1 and M_2. Type A requires one minute of processing time on M_1 and two minutes on M_2. Type B requires one minute on M_1 and one minute on M_2. The machine M_1 is available for not more than 6 hours 40 minutes while machine M_2 is available for 10 hours during any working day.

(a) Formulate the problem as a linear programming problem.

(b) Using the simplex method find how many products of each type should the firm produce each day in order to get maximum profit.

19. a) Find the solution to the following linear programming problem by solving its dual.

Maximize $z = 6x_1 + 8x_2$

Subject to $5x_1 + 2x_2 \leq 20$

$x_1 + 2x_2 \leq 10$

$x_1, x_2 \geq 0$

b) Using the simplex method solve:

Maximize $z = 2x_1 + x_2$

Subject to $x_1 - x_2 \leq 10$

$2x_1 - x_2 \leq 40$

$x_1, x_2 \geq 0$

(12+8)

20. Using Gomory's method find an optimum integer solution to the following Linear Programming Problem.

Maximize $z = x_1 + 2x_2$

Subject to $2x_2 \leq 7$

$x_1 + x_2 \leq 7$

$2x_1 \leq 11$

$x_1, x_2 \geq 0$ and x_1, x_2 are integers.