

Parshvanath Charitable Frugt's

(Approved by AICTE New Delhi & Govt. of Maharashtra, Affiliated to University of Mumbai) (Religious Jain Minority)

Subject: Applied Mathematics IV

SEM:IV

Quality:

Definition:The phenomenon occurring in linear programming that given a problem there exists another closely related problem with the same set of data. and with the same solution is called the principle a duality

Procedure:

* write the objective function in maximisation type,

if not. * White all the constraints in = type. It any constraint is in > type multiply the inequality by -1' and change the inequality =

* It the constraint is of equality type, change

it into inequality type,



Parshvenesh Chestellis Vinces

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for example 3x, +6x2 = 7 is equivalan to Briffing & TE anothers Now, 37,4670 27 = 5-37, 4670 <-7.

> : 37,46%=7 is now equivalent to Briffons ET & -37,-67, 4-7.

* All decision variables must be > type. It any variable is unrestricted say no, thon write na as No = No - No * In the primal in the standard form (i) the objective function is of maximisation type with the constraints in 2' type & (11) the objective function is of minimisation type

with the constraints in >' type.



<u>Parativaneth Charliedde Greek</u>s

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Now write the dual by

* Write the objective function from

maximisation to minimisation

(1) Construct the dual of the following problem

Minimise Z= 72+373

Subject to DNI +ND = 3

25 Exg+ck8+1k

-x1+x2+2x2 = 2

N.172, 73 20.

Soln: Since the objective bunction is of

minimisation type, the constraints should be > type

-7,472 forz = 2 can be control as

-7, +M2+0M3 = 2 2 -7, +M2+0M3 = 2 => x1-M2-2M3 = -2 4 -7, +M2+0M3 = 2.



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Primal · The

Minim me Z= DN1770+313

subject to -811-10 +013 2-3

71+010+613 25

-71+ MD + DM3 2 &

2-5 ERB-6K-1K

A1170, 73 = 0.

Since the last constraint is now expressed

constraints, we have $y_3 = y_3' - y_3''$ 2 as

.. The dual is

Maximise w=-3y1+5y0+2y3'-2y3"

subject to -24, +40-43+43" =0

-y, + 249 + 43'-43" <1

04, +642 +242, -242" =3

Since y3=y3'-y3", y2 & umestricted,

: The dual



Barelivaneth Charlenge Grants

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Maximine
$$W = -3y_1 + 5y_2 + 3y_3$$

subject to $-3y_1 + y_2 - y_3 \leq 0$
 $-y_1 + 3y_2 + y_3 \leq 1$
 $-y_1 + 3y_2 + 3 \leq 3$
 $-y_1 + 3y_3 \leq 3$

Find the dual of the foligi: LPP.

Maximise
$$Z = ax_1 - ma + 3m_3$$

subject to $x_1 - an_2 + m_3 \ge 4$
 $ax_1 + m_3 \le 10$
 $x_1 + m_2 + 3m_3 = av$
 $x_1 + m_3 \ge 0$, m_2 unrestricted.

Soln:

 $x_1 = x_2 = ax_1 - (m_2 - m_3) + 3m_3$

Subject to $-[x_1 - a(m_3 - m_3)] + 3m_3$

Subject to $-[x_1 - a(m_3 - m_3)] + m_3] \le -4$.

 $ax_1 + (x_3 - x_3) + 3m_3 \le 0$
 $x_1 + (x_3 - x_3) + 3m_3 \le 0$



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The Primal is

Maximise
$$Z = \partial n_1 - n_0' + n_0'' + 3n_3$$

subject to $-n_1 + \partial n_2' - \partial n_0'' - n_3 \le -4$
 $\partial a_1 + \partial n_0' - \partial n_0'' + 3n_3 \le 10$
 $x_1 + n_0' - n_0'' + 3n_3 \le 0$
 $-x_1 - n_0' + n_0'' - 3n_3 \le -20$
 $x_1 + n_0' + n_0'' - 3n_3 \le -20$
 $x_1 + n_0' + n_0'' - 3n_3 \le -20$

The dual is

Minimise $w = -4y_1 + 10y_1 + 2y_2' - 20y_3''$

Subject to $-y_1 + 2y_2 + 2y_3'' > -1$
 $-2y_1 + 0y_0 + 2y_3' - 2y_3'' > 2$
 $-2y_1 + 0y_0 + 2y_3' - 2y_3'' > 2$
 $-2y_1 + 2y_0 + 2y_0 + 2y_0 + 2y_0 > 2$

Subject to $-y_1 + 2y_0 + 2y_0 > 2$
 $-2y_1 + 2y_0 + 2y_0 > 2$

Prof. Nancy Nimal

Department of Humanities and Applied Sciences