ASSIGNMENT 5 PROBLEM 1 1) macc $j = 2$ $i \neq 2$ $j = 3$ St $j = 3$ $i \neq 3$ $j \leq 6$ $i \in \{2,, m\}$ $0 \leq x_j \leq 1$ $x_j \in \mathbb{Z}$ $x_j = 0$ (0) 1 correspond to not proceeding (or) Proceeding with project j . 2) min $j = 1$ $j = 1$ $j \in \{1,, m\}$ $x_i = 1$ $i \in \{1,$	il de la company	
PROBLEM 1 1) masc $j=2$ $C_j z_j$ Set $j=3$ $C_j z_j \le b_i$ i $E\{2,,m\}$ $0 \le x_j \le 1$ $x_j \in \mathbb{Z}$ $x_j = 0$ (0) 1 correspond to not proceeding (or) Proceeding with project j . 2) min $j=2$ $C_j z_j + j=3$ $C_j z$		ASSIGNMENT 5
2) mac j=2 cj2; S.t j=aij xj ≤ bi i ∈ {2,, m} O≤2; ≤ 1 x; ∈ Z Xj = 0 (0) 1 correspond to not proceeding (01) Proceeding with project j. 2) min i= i= cij xij + i= fifi St i= xij = 1 i ∈ {1,, m} 2i; ≤ y; i ∈ {1,, m} 2i; ≤ y; i ∈ {1,, m} 2i; ≥ 0; 0≤ y; ≤ 1; y; ∈ Z 2i; > 0; 0≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; ≥ 0; o≤ y; ∈ Z 2i; ≥ 0		
2) mac j=2 cj2; S.t j=aij xj ≤ bi i ∈ {2,, m} O≤2; ≤ 1 x; ∈ Z Xj = 0 (0) 1 correspond to not proceeding (01) Proceeding with project j. 2) min i= i= cij xij + i= fifi St i= xij = 1 i ∈ {1,, m} 2i; ≤ y; i ∈ {1,, m} 2i; ≤ y; i ∈ {1,, m} 2i; ≥ 0; 0≤ y; ≤ 1; y; ∈ Z 2i; > 0; 0≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; > 0; o≤ y; ≤ 1; y; ∈ Z 2i; ≥ 0; o≤ y; ∈ Z 2i; ≥ 0		PROBLEM 1
Sit $j \in \{a_{ij}, x_{j} \leq b_{i}\}$ if $\{2,, m\}$ $0 \leq x_{j} \leq 1 x_{j} \in \mathbb{Z}$ $x_{j} = 0 \text{ (n) } 1 \text{ correspond to not Proceeding (on) Proceeding with project j. 2) min j \in \{c_{ij}, x_{ij} \neq 1, f_{i}, f_{i}$		
Sit $j \in \{a_{ij}, x_{j} \leq b_{i}\}$ if $\{2,, m\}$ $0 \leq x_{j} \leq 1 x_{j} \in \mathbb{Z}$ $x_{j} = 0 \text{ (n) } 1 \text{ correspond to not Proceeding (on) Proceeding with project j. 2) min j \in \{c_{ij}, x_{ij} \neq 1, f_{i}, f_{i}$	1)	masc j=1 cjx;
$X_{j} = 0 \text{ (6)} 1 \text{ correspond to not proceeding (or) proceeding with project j.}$ 2) min $\sum_{i=1}^{m} C_{i,j} \times i_{i,j} + \sum_{i=1}^{m} J_{i} Y_{i}$ $S + \sum_{i=1}^{m} X_{i,j} = 1 i \in \{1,, m\}$ $X_{i,j} \leq Y_{i} j \in \{1,, m\}$ $X_{i,j} \leq Y_{i} j \in \{1,, m\}$ $X_{i,j} \geq C_{i,j} \times Y_{i} \leq Y_{i} $		
$X_{j} = 0 \text{ (6)} 1 \text{ correspond to not proceeding (or) proceeding with project j.}$ 2) min $\sum_{i=1}^{m} C_{i,j} \times i_{i,j} + \sum_{i=1}^{m} J_{i} Y_{i}$ $S + \sum_{i=1}^{m} X_{i,j} = 1 i \in \{1,, m\}$ $X_{i,j} \leq Y_{i} j \in \{1,, m\}$ $X_{i,j} \leq Y_{i} j \in \{1,, m\}$ $X_{i,j} \geq C_{i,j} \times Y_{i} \leq Y_{i} $		S.t j= aij xj ≤ bi i € {2,, m}
$x_{j} = 0 \text{ (n) } 1 \text{ correspond to not Proceeding (on) Proceeding with project j.}$ 2) min $\sum_{i=1}^{n} \sum_{j=1}^{n} C_{i,j} x_{i,j} + \sum_{i=1}^{n} \int_{i} y_{i,i}$ $x_{i,j} \leq y_{i,j} = 1 i \in \{1,, m\}$ $x_{i,j} \leq y_{i,j} \leq y_{i,j} \leq y_{i,j} \leq y_{i,j} \leq y_{i,j}$ $x_{i,j} \neq constoner \text{ j's requirement Supplied from depot i.}$ $y_{i,j} \Rightarrow taks \text{ Value } 0 \text{ (n) } 2 \text{ Corresponding to whether a particular site being not selected (n) } \text{ substituted of } x_{i,j} = y_{i,j} = y_{i,j}$		
with project j. 2) min $i = \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} $		$0 \le x_j \le 1$ $x_j \in \mathbb{Z}$
with project j. 2) min $i = \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} \sum_{i=1}^{m} \sum_{j=1}^{m} $		Y: = 0 (m) 1 (m) Projection
min $i = 1$		with project
5. t $\underbrace{z_1}_{i=1} \times z_i = 1$ $i \in \{1,, m\}$ $x_i \le y_i = j \in \{1,, m\}$ $x_i \le y_i = j \in \{1,, m\}$ $x_i \ge y_i$		2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
5. t $\underbrace{z_1}_{i=1} \times z_i = 1$ $i \in \{1,, m\}$ $x_i \le y_i = j \in \{1,, m\}$ $x_i \le y_i = j \in \{1,, m\}$ $x_i \ge y_i$	2)	min it is coix is + it fits
$2ij \geq 0 ; 0 \leq 9i \leq 2 ; 9i \notin \mathbb{Z}$ $2ij \geq 0 \text{ and former } j's \text{ requirement Supplied from } depot i.$ $9i \Rightarrow takes \text{ Value } 0 \text{ (a) } 2 \text{ Corresponding } to \text{ whether } a$ $particular \text{ Site being not Selected (a) Selected.}$ $3) \text{ min } x_1 + x_2 + x_3 + x_4 + x_5 + x_6.$ $5 + x_1 + x_2 \geq 2$ $2_1 + 2_1 \geq 2$ $2_3 + 2_4 \geq 1$ $2_3 + 2_4 + x_5 \geq 1$ $2_3 + 2_4 + x_5 \geq 1$ $2_4 + 2_5 + x_6 \geq 1$ $2_4 + 2_5 + x_6 \geq 1$ $2_1 + 2_5 + x_6 \geq 1$		
$2ij \geq 0 : 0 \leq 9i \leq 1 : 9i \notin \mathbb{Z}$ $2ij \geq costomer j's requirement Supplied from depot i.$ $9i \Rightarrow takes Value 0 (0); 2 Corresponding to whitee a particular site being not selected (0) selected.$ $3) min $		$s + \underbrace{z}_{i=1} \times i = 1$ $i \in \{1,, m\}$
$2ij \geq 0 : 0 \leq 9i \leq 1 : 9i \notin \mathbb{Z}$ $2ij \geq costomer j's requirement Supplied from depot i.$ $9i \Rightarrow takes Value 0 (0); 2 Corresponding to whitee a particular site being not selected (0) selected.$ $3) min $	A Control	$x: i \leq y$; $i \in \{1,, n\}$
$\begin{array}{c} \chi_{i,j} \rightarrow customer j's \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \$	The state of the s	ALL C'T
depot i. $y_i \rightarrow takes \ Value \ 0 \ (a) \ 2 \ Corresponding to white a particular Site being not selected (a) Selected. 3) min x_1 + x_2 + x_3 + x_4 + x_5 + x_6. s + x_1 + x_2 \ge 1 x_1 + x_2 + x_3 \ge 1 x_1 + x_2 + x_3 \ge 1 x_2 + x_4 \ge 1 x_3 + x_4 + x_5 \ge 1 x_4 + x_5 + x_4 \ge 1 x_2 + x_5 + x_4 \ge 1$	3	Tijzo, os gist, giez
depot i. $y_i \rightarrow takes \ Value \ 0 \ (a) \ 2 \ Corresponding to white a particular Site being not selected (a) Selected. 3) min x_1 + x_2 + x_3 + x_4 + x_5 + x_6. s + x_1 + x_2 \ge 1 x_1 + x_2 + x_3 \ge 1 x_1 + x_2 + x_3 \ge 1 x_2 + x_4 \ge 1 x_3 + x_4 + x_5 \ge 1 x_4 + x_5 + x_4 \ge 1 x_2 + x_5 + x_4 \ge 1$		The sustained is the impact Supplied to me
9; \rightarrow takes value 0 (0) 2 Corresponding to whether a particular Site being not selected (0) Selected. 3) min $x_1 + x_2 + x_3 + x_4 + x_5 + x_6$. 5 t $x_1 + x_2 \ge 1$ $x_1 + x_2 + x_3 \ge 2$ $x_1 + x_2 + x_4 \ge 1$ $x_2 + x_4 \ge 1$ $x_3 + x_4 + x_5 \ge 1$ $x_4 + x_5 + x_6 \ge 1$ $x_4 + x_5 + x_6 \ge 1$ $x_4 + x_5 + x_6 \ge 1$ $x_5 + x_6 + x_6 \ge 1$ $x_6 = \begin{cases} 1 & \text{if fire station} \\ 1 & \text{else} \end{cases}$		
3) min $x_1 + x_2 + x_3 + x_4 + x_5 + x_6$. $5 + x_1 + x_2 \ge 1$ $x_1 + x_2 + x_4 \ge 1$ $x_2 + x_4 + x_5 \ge 1$ $x_3 + x_4 + x_5 \ge 1$ $x_4 + x_5 + x_6 \ge 1$ $x_2 + x_5 + x_6 \ge 1$		4> takes Value 0 (01) 2 Corresponding to whether a
3) min $x_1 + x_2 + x_3 + x_4 + x_5 + x_6$. 5: $t = x_1 + x_2 \ge 1$ $x_1 + x_2 + x_1 \ge 2$ $x_2 + x_4 \ge 1$ $x_3 + x_4 + x_5 \ge 1$ $x_4 + x_5 + x_6 \ge 1$ $x_4 + x_5 + x_6 \ge 1$ $x_4 + x_5 + x_6 \ge 1$		particular site being not suched (a) solucted.
5. t $x_1 + x_2 \ge 1$ $x_1 + x_2 + x_1 \ge 2$ $x_2 + x_4 \ge 1$ $x_3 + x_4 + x_5 \ge 1$ $x_4 + x_5 + x_1 \ge 1$ $x_2 + x_5 + x_1 \ge 1$		
$2_1 + 2_1 + 2_1 \ge 2$ $2_3 + 2_4 \ge 1$ $2_3 + 2_4 + 2_5 \ge 1$ $2_4 + 2_5 + 2_1 \ge 1$ $2_2 + 2_5 + 2_1 \ge 1$ $2_3 + 2_5 + 2_1 \ge 1$	3)	min $x_1 + x_2 + x_3 + x_4 + x_5 + x_6$.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		$5 + \alpha_1 + \alpha_2 \ge 1$
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$		$2, +2, +2, \geq 2$ $2, +2, +2, \geq 2$ enitt at ity i
$\begin{array}{c} 2_{4} + 2_{5} + 2_{i} \ge 1 \\ 2_{2} + 2_{5} + 2_{i} \ge 1 \end{array}$		
2, + 25 + 2, 21		3 7 3 - 1
	-9-	
0 = x; = 1 = E1,, 13 2; EZ		0 = zi = 1 i = {1,, 13 zi = Zi

	PROBLEM	12		
	Cn,	Massimize 3x,	+ 42.	4
			+ 2 43	
			- 752 ≤1	
		220	$\lambda \in \mathbb{Z}$	
"	a) LP	reliation of the	ator problem	8.
		BEAL OF S		
	M.	sc 3x, + 422		
	3	1+ 2/5x, + x2 53		
		2/52, -2/52 5	1	
		220.	ARRENT LAND	
	X 2			
		2. 16 7 7 4 2	Sale Lite III	
		Share a series	FEASIBLE	VALUE
		A STATE OF THE PARTY OF THE PAR	POINTS	
		10 th	(0,0)	0
	5		(0, 3)	12
			(2.5,0)	7.5
	* *	SOL. FOR LP	€ (3.93,1.43)	17.5
	36	RELAXATION	7 61	
	2	0/2	215	
		ILP PIL	7137	
	1	SOLUTION	3 stx terr	
	(122	
	-1	1 2 3 + 5	6 7 8 9	×
	-2			
	-5			
	1			
	1			

	b) Stande form of the give problem.
	max 3x, +422
	S+ 22,+52, <15
-	22, -22 55
	x >0, x + Z
	c) Initial Dictionary,
	D: 23 = 15 - 22, -52
-	$x_4 = 5 - 22, + 222$
	$z = 3z_1 + 4x_2$
	"22 is the entering & "x3" is the leaving variable.
	D_1 : $X_2 = 3 - 0.4x_1 - 0.2x_3$
	$x_{q} = 11 - 2.8x_{1} - 0.4x_{3}$
	2 = 12 + 1.42, -0.823
	the second of th
	"2," is the enturing & x & is the leaving Variable.
	$D_{2}: \qquad x_{1} = \frac{11}{2 \cdot 8} - \frac{0.4 \cdot 23}{2 \cdot 8} - \frac{24}{2 \cdot 8}$ $x_{2} = \frac{10}{7} - \frac{23}{7} + \frac{24}{7} \Rightarrow FINAL$
	$Z = 175 = X_3 - 0.5X_4 DICTIONARY$
	1. the optimal sol is (11/2.8, 10/7) & optimal value
	is 17.5
-	-) GOMORY CUT ON 2, YOW.
	2, = 11/2.8 - 0.4 25/2.8 - 24/2.8

formula, frac (-ax,) 2 12 + ... + frac (-ax,) 2 in 2 fracle frac (x) = 2 - Lx1 2, + 23/7 + 24/28 = 11/2.8 2, + 1/23 + 1/2.8 24 = 3 + 0.928 A: integer : B: integer + fraction. ⇒ Y₇ 2₃ + Y_{2.8} 2_f ≥ 0.928 .. the cut to be added to the dictionary is -0.928 + 23/7 + 24/2.8 b) Final dictionary after adding the cut. 2,= 11/2.8 - 23/4 - 2+/2.8 x= 10/7 -23/7 +24/7 x5 = -0.928 + ×3/7 +24/2.8 2= 17.5 -23 -0.524 As the dictionary contains negative value for one of the basic variables, the above dictionary is infeasible () dual of the above dictionary. 93 = 1 + 17 41 + 17 42 - 17 45 4 = 0.5 + 1/2.8 31 -1/7 42 - 1/2.8 35 g = -17.5 -11/2.8 4, -10/7 42 + 0.928 45

The dual dictionary is feasible, but not final. d) In the dual dictionary about. y 5 is the entering and y is the leaving variable 75 = 1.4 + 4, -0.442 -2.844 43 = 0.8 + 0.24, +0.44 = -16.2 -34, -1.84 - 2.64 Concerting back to primal. 2, = 3 + 0 - 25 22 = 1.8 - 0.2 x3 + 0.4 x5 24 = 2.6 -0.4 ×3 +2.825 Z = 16.2 -0.8 23 -1.4 25 .: the Sol. is (3,1.8), but this doesn't solve the ILP. 3) a) Initialisation Phase: Adding to the dictionary obtained in 26), we get D: x, = 1/2.8 - 23/7 - 24/2.8 + 20 22 = 10/7 - 23/7 +2+/7 +26 25=-26/28 + 23/7 +24/28 +20 Forcing to to have, we get

	$D_1: X_0 = \frac{2.6}{2.8} - \frac{x_{3/7}}{7} - \frac{24}{2.8} + \frac{x_5}{7}$
	$z_1 = \frac{13.6}{2.8} - \frac{2x_{3/7}}{7} - \frac{x_{4/1.4}}{7} + \frac{x_5}{7}$
	$\frac{2}{2} = \frac{6.6}{2.8} - \frac{2}{2} \frac{3}{7} - \frac{0.624}{2.8 + 35}$
	z = -2.6/2.8 + 23/7 + 2+/2.8 - 25
A Comment	
	'xq' is the entering Variable & xo' is leaving.
	D2: 24 = 2.6 -0.423 + 2.825 - 2.820
	$z_1 = 3 - z_5 + z_8$
	Zz= 1.8 -0.223 +0.435 +6.120
	z' = 0
	The second secon
	removing to & Sub. back the original z, me get.
	$D_3: \chi_1 = 3 -\chi_5$
	22=1.8-0.23 +0.425 => FINAL
	24=2.6-0.42, +2.8x DICTIONARY
	2=16.2-0.82,-1.425
3-1-B-2	Section to the state of the second section of the second section of the second
	The optimal Sol . is (3,1.8) & Value is 16.2.
	b) solving the ILP, Continuing with the dictionary we got after one cut in 2d), we have.
	we got after one but in ad, wehave.
	$D: \chi_1 = 3 - \chi_5$
	22=1.8-0.23 +0.4x5
	24 = 2.6 - 0.423 + 2.825
	Z=16.2-0.823-1.+25
	cutting the row, 2 + 0.2 x 3 + 0.4 x = 1.8, reget.
	2-25 +0.213 +0.625 = 1+0.8
	A B

	⇒ 0.2x3 + 0.625 ≥ 0.8	
	adding this constraint to the dictionary,	we get .
	$x_1 = 3$	
	$x_2 = 1.8 - 0.22 + 0.42 $	
	$x_4 = 2.6 - 0.423 + 2.825$	
	$2l_{1} = -0.8 + 0.2x_{2} + 0.6x_{5}$ $2 = 16.2 - 0.8x_{5} - 1.4x_{5}$	
	Z = 16.2 - 0.813, -1.425	
	Since the above dictionary is injectible, but	· 73
	dual is pasible, we get the dual as.	
	D. T. S.	
	43 = 0.8 +0.242 +0.444 -0.2	
-	45 = 1.4 + 4, -0.442 -2.844 -0.6	
	$ \xi = -16.2 - 34, -1.84, -2.64 + 0.65 $	_
	'y's the entiring & '45' is the leaving Va	riall.
	96 = 1.4/0.6 + 10.64, -0.4/0.62 -2.8/0	
	43 = Y3 - Y34, + Y342 + 4134.	4 + 35/3
	£ = -43/3 -5/35, -7/35, -11/354	- 4/3 45
	Converting back to primal, we get.	
	x1 = 5/3 - Yo. (x1 + Y3 2)	
	x2 = 7/3 + 0.4/0.6 x6 - 43 x3	
	24 = 19/3 + 2 8/0.6 21 - 4/3 23	
	$25 = \frac{4}{3} + \frac{1}{0.1} \frac{2}{0.1} - \frac{1}{3} \frac{2}{3}$ $2 = \frac{43}{3} - \frac{1.4}{0.1} \frac{2}{0.1} \frac{2}{0.1} \frac{2}{3} \frac{2}{3}$	
	13 16.1 6 13 3	
3	essing Gonory cut to cut the 2, row, we go	t new rou
	$z_{i} + z_{3} \ge 1$	

The new Dictionary is 2, = 5/3 - 406 26 + 4323 x2 = 7/3 + 0.4/0.626 + (-1/323) 24 = 19/3 + 2.8/0.626 + (-4/323) 25 = 4/3 + Yo. 6 26 + L-Y3 x3) x7 = -1 + x6 + 23 Z = 43/3 -1.4/0.626-1/323 Sarle this dictionary is ingrasilly, but its dual is feasible converting it to dual we get. 91 = 1.4/0.6 + 10.64, -2/342 -2.8/0.64 - 10.695 - 57 43 = Y3 - Y34, + 1342 + 4/3 34 + 1/3 55 - 57 g = -43/3 -5/3 5/ - 7/3 5/ - 19/3 5/ - 4/3 5/ +9 97 is the entiring & 43 is the leaving variable. 47 = 43 - 43 4, + 1342 + 41344 + 1345 - 73 4 = 2 - 24, - 42 - 6 44 - 255 + 43 g = -4 -29, -242 -544 -45 -73 Converting it lack to primal, we get. x1 = 2 + 13 x7 +2 x1 x2 = 2 - 13 x2 + 1 x1 Find dictionary 24 = 5 - 413 x7 + 6 x1 25 = 1 - 13 27 +2 26 x3 = 1 +1 x7 -1 x6 Z = 14 - Y3 27 - 2x6 Substituting \$ 6 & x7 =0, we get 2,=2, 2,=2, 24=5,

.. The ILP solution is (2,2) & Value is 14. 1) The cuts that we got are, $x, \leq 3$ 2,+2, 54 2,+2251. FEASIBLE It is clearly evident from the graph, the optimal solution (2,2) is indeed a vertex of the resulted fesible set after different cuts.

PROBLEM 3 900, Min 20-32,-422 5.+ 2152,+12 =3 2/52, -2/522 61 220, 262 Converting it to Std. form, we get . Masc -20+3x,++22 The other branch s. + 2x, +5x2 < 15 Constraints are. 2x, -22 55 22222,52 220, 262 242 SOLUTION 1

(X) Noti- In this problem since Max-20+3x, + 402 can be replaced as Max 32, ++x2 and solved, at last by adding - 20 to the answer of aired b) The node Pois the same problem solved in Problem 2, 10), we get the Volum of 2, b x, as (3.93, 1.43) Now using branch & bound on it, we get. PII :- 2 1 the milial Dictionary is x3 = 15 - 2x, - 5x2 24 = 5 - 22, + 212 $z = 3x_1 + 4x_2$ 'I's Entering & 25's the liaving Variable. D1: 22=1 -25 23=10-22,+525 x4= 7-2x,-225 Z = 4 + 32, -425 '2, 'is Entering & 24 is the leaving Voriable. D2: 2,=3:5-0:524-25 Zz=1 -25 > FINAL 23 = 3 + 24 + 7x5 DICTIONARY Z=14.5 -1.5 14 -725 . The optimal Solution is (3.5, 1) & Value is 14.5 P12: - I 22 22, the initial dictionary is infeasible , so initialisation is

D= 23=15-2x,-5x2 24= 5-2x, +2x2 25= -2 +22 2= 32,+422 Adding so & proceeding with initialisation phase. D, - 20 = 2 -22+25 23=17-20, -62,+25 24 = 7-22, + 22+25 z = -2 + 32 - 25 Z'z is entering & 20 is leaving Variable. D2: 2=2 +25-20 23 = 5-20, -5x5 +6x, 24=9-22,+225-20 2 = -20. Sub-back the original 2, we get. 22=2+25 P3 :-2,=5-525-21 24=9+2×5-21 2=8++25+32, '2's Enturing & 23' is leaving Variable. 77 KA 25=1-0.42, -0.223 04: 22=3 -0.41, -0.213 24=11-2.8x, -0.423 Z= 12 +1.42, -0.823

	'x' is entering and x's is leaving.
	D5:- X, = 2.5-0.5 x3 -2.5 x5
	$x_1 = 2$ $+25$ \Rightarrow FINAL
	24 = 4 -1.823 -725 DICTIONARY
	$z = 15.5 - 1.5 \times_3 - 3.5 \times_5$
	: optimal solis (2.5,2) & value is 15.5
	P2, :- I, < 3, the without Dictionary is.
	b:- 23 = 15-2x, -5x2
	$x_4 = 5 - 2x_1 + 2x_2$
	25=1: -22:
•	$x_6 = 3 - x_1$
	2 = 32, + 422
	'22' is enturing & 25 is leaving Variable.
	D,:- 22=1-25
	23=10 +525-221
	x+=7 -2x5-2x1
	2i = 3 $-2i$
	$z = 4^{-4} + 25^{+3}$
	'à' is entering d' 2' is lianing Variable.
	$D_2 = 0$, $X_1 = 3 - Z_1$
	$2_2 = 1 - 25$
	23 = 4 +216 +525 > FINAL
	Za=1+2×1 -2×5 DICTIONARY.
	2 = 13 - 425 - 324

: optimal Sol is (3,1) & value is 13 P22 - 2124, the initial dictionary is infrasible, ausilory phase needed. D: x3 = 15-2 x1 -5x2 x4= 5-2x, +2x2 25=1 -22 x6 = -4 +21 z = 3x, + 4xForing 20 to enter, we get. 2, = 4 -2, + x, D, -23 = 19 - 32, +26 -522 24= 9-32,+11-322 25=5-2,+26-22 2 = 4 + x1 - x6 '2', is entiring and 24 is leaving. In = 6 + 22 + x 413 + 2x1/3 D .-2,=3-x2-x4/3+x1/3 23=10-222 + X4 => FINAL 215=2 +24/3+226/3 DICTIONARY. 2=-1-12-24/3-224/3 since the Value of 2 is -ve for the auxiliary problem, the problem is englaseble. Pros 2, 52, the intial dictionary is inposite, don't disation is required.

23=15-22, -522 D: 24= 5-22, +222. 2,=-2 +22 2,=2 -21 $z = 3x, + 4x_2$ Introducing to we get. D, .-20 = 2 - 22 + 25 23=17-622+25-22 24=7+22+25-221 x1 = 4 - x2 + 25 - 21 2=-2+22-25 '2) is Enturing & 2's leaving. D2:- 22=2+25-20 23 = 5-525-22, + 620 24= 9 +225-22,-20 $2L_{6}=2$ -2,+202 = - 10. renoving to & sur. each the original 2, we get. D3:- 2, = 2+25 23 = 5 -5 x5 -2x1 x4 = 9 + 2x5 - 22, $x_i = 2$ -2z = 8 + + x5 + 3x, 25 is entiring & 23' is living variable.

	D4 25 = 1-0.42, -0.223	
	22=3-0.42, -0.223	
	$2_{4} = 11 - 2.8x, -0.4x_{3}$	
	71=2-21	
	$z = 12 + 1.4x, -0.8x_3$	
	'x's entering & I's leaving Variable.	
		-
	Ds: 2,=2-x	
	$x_2 = 2.2 + 0.4x_4 - 8.2x_3$	
	25 = 0.2 + 0.4x (-0.2x3 => FINAL	-
	24=5.4 +2.8x; -0.4x3 DICTIONAL	RY
	2 = 14.8 -1.41 -0.813	
	optimal sol is (2,2.2) & value is 17.8.	
	P24:- 24, Z3, the initial dictionary is infessible	4
	the initialisation phase is veguin	1
	D:- 23 = 15-22, -52	
	24=5-22,+222	
	25 = -2 + 22	-
1800	$\frac{1}{2} = -3 + 2$	
	2 = 3x, + 422	-
	A STATE OF THE STA	
	adding to, we get.	
	Control of the Contro	-
	$D_{i} := \lambda_{0} = 3 - \lambda_{i} + \lambda_{i}$	-
	23=18-32,+26-52	
	2+ 8-32, +1/ +LZ,	-
	25 = 1 - 2, + 24 + 2 $2 = -3 + 2, -24$	
	2 = - 3 + 5	-

'x', is entering 2'x5 is leaving variable D2 = 21 = 1 + 22 - 25 + 21. 2, = 2 - 1, +25 23=15-812+385-2X1. X4=5-8,+3x5-221 2=-2+22-25 2's enturing & x's leaving Variable 22=2+25-X0 D3:-21=3+1,-20 23=-1-515-226+810 24=3+225-226+20 マ=-メロ After veroving to, & substituting back 2, we get 2=0; but the problem is infeasible as it has a - ve Valu. P31: 2252, the problem's initial dictionary is infrasible & needs initialization. 23=15-22, -512 D:-24=5 -22, +212 25 = - 2 + 12 X,= 2 -21 27=2 -12 z = 31, +412 Adding to, we get.

2, = 2-x, +x5 D, :-23=17-6x,+05-22, 65. 24=7+22+25-221 @ 26=4-12+25-21 Œ 27=4-21,+25 (85) 2 = -2 + 12 - 25 @ E " is Entering & 2's is leaving Variable. 6 **6** 22 = 2 + x5 - 20 D2 :-61 23= 5-525 + 120-2x, **C** 63 x4=9+2x5-x6-2x1 63 x1=2 +x, -21 6 27 = -25+2×0 6 0 Z = - x . . 6 6 removing 202 Sur back original Z, mg. 4. 6 22=2+25 D3:-6 6 x3=5-525-22, 24=9 +225 -22) $x_1 = 2$ $-x_1$ 27 = -25 2=8++15+321 2, 's entering & x's leaving. $x_1 = 2 - 26$. D4: 2, = 2 + 25 23=1-5x5+2x6. x 4 = 5 +21g -211. $\chi_7 = -25$ = 14 + 425 - 26

'x's is entering 2 x'7 is leaving Variable. 25 = - 27 2,=2-21 => FINAL 12=2-27 DICTIONARY. X3=1+5x7+2X1 24=5-217-224 Z=14-4×7-×6 is the optimal Value is 14 & sol is (2,2) P32: The Instial dictionary is infeasible to needs auxiliary phase. D= x3 = 15-22, -5x2 x4 = 5 - 2x, +222 2,=2-2, $x_{7}=-3$ $+x_{2}$ Z = 3x, +4x2 removing the constraint 2,22, as it is covered ly 2,23 & adding to, we get. x = 3 -22 + 26 D, :x3 = 18-6x2+x6-221 24 = 8 + x2 + 36 - 22, 25 = 5 - x2 + x6 - x1 $x_0 = -3 + x_1 - x_2$ '2', is enturing & to is leaving Variable.

Dy: 22 = 3+26-20 23= -52,-22, +600 x = 11+2x,-12, -20 25 = 2 -x1 + 20 2= - 20. removing X & & substituting back original sol. weget. D3: 22 = 3 + x6 x3= -5x6-221 24=11+221-221 25=2 -21 z = 12 + 4x, -3xI' is cuting & 2's is leaving Variable. 26 = -0.223 = 0.4x1 D4:-22=3-0.223-0.4x1 24 = 11-0.423-9.821 => Final 25=2+0 - 21 Dictionary. Z= 12-0.823-46x, " the optimal Sol is (0,3) & Volue's 12. Now, the below table gives us the reason for the Node lagarching (or) Not & the optimal Value & sol. for the Actual problem.

NODE	OPTIMAL	OPTIMAL	OPTIMAL	REASON
	SOL.	VALVE	VALVE	
		For 2 = 32, +4×2	Forz = 20+32,+4	1)*4
Po	C"/2.8,10/7	17.5	2.5	No Int. So
PII	(3.5,1)	14:5	5.5	No Int. Set
P12	(2.5,2)	15.5	4.5	NoIntsol
P2)	(3,1)	13	7	Prund
P22	_	_		Injusite
P23	(2,2.2)	14.8	5.2	No Int sol
P24	_	-	-	Infeasily
P31	(2,2)	14	6	FEASIBLE SO L
P32	(0,3)	12	8	praved

: The ILP Sd. is (2,2) & Volue is 6.