Quiz 2 Solutions

Q1 For the LPP described by

$$\max\ 12x_1 + 12x_2$$
$$\text{s.t. } 3x_1 + 4x_2 \leq 12$$
$$4x_1 + 3x_2 \leq 12$$
$$x_1, x_2 \geq 0$$

the dual is:

$$\min\ 12w_1 + 12w_2$$
$$\text{s.t. } 3w_1 + 4w_2 \geq 12$$
$$4w_1 + 3w_2 \geq 12$$
$$w_1, w_2 \geq 0$$

One may plot to see that optimal solution is attained at some point (Alternatively, as the eqns for constraints are same in equality mode & their is only common pt. ~~which is~~ in the intersection of the two feasible region which is optimal for both !!!). Think why?

Q2 The dual of the given problem is

$$\min\ 6w_1 + 12w_2$$
$$\text{s.t. } 2w_1 + 3w_2 \geq 5$$
$$w_1 + 4w_2 \geq 3$$
$$w_1 \leq 0,\ w_2 \geq 0$$

which lies on y-axis (w_2-axis) & hence is in both quadrants. Note that as optimal soln for original (given) LPP exists, it will also exist for dual (guaranteed).

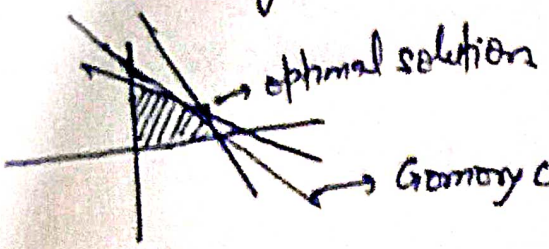
Q3 Plot the LPP to get $(\frac{3}{2}, 1)$ as optimal solution. As it satisfies $x_1 - x_2 = \frac{1}{2}$ or $2x_1 - 2x_2 = 1$, option (A) is correct (optimal soln does not change if $2x_1 - 2x_2 = 1$ is introduced.

Q4 A is incorrect as if you optimize $x+y$ over the square $\frac{1}{2} \leq x \leq \frac{3}{4}$, $\frac{1}{2} \leq y \leq \frac{3}{4}$ the LPP will have optimal solution but the IPP will be infeasible.

B is correct. As simplex method has exponential time complexity (and Gomory method uses simplex to solve the IPP) Gomory's method has exponential time complexity.

Q5 Plot to see that (3,5) is in the feasible region & yields the value 27.

Q6. Gomory cut constraint cuts off the optimal solution obtained in the last iteration, i.e. optimal solution lies in the region cut but the Gomory constraint but may not lie on the constraint itself.



obviously as per the construction, plane need not be parallel to any of the constraints & may not pass through origin.