QUESTION 15/11 SOLUTION (Cantele Alberto/Cancelliere Biagio)

Given the availability, product 1 and product 2 of each resource (A, B, C) and the revenue per item, we can plan the production to maximize the revenue formulating the primal and the dual in the following way:

DIRECT:

$$X_{\mu 1} = Quantity\ of\ product\ 1$$

$$X_{\mu 2} = Quantity\ of\ product\ 2$$

$$\begin{array}{ll} MAX & 3X_{\mu 1} + 5X_{\mu 2} \\ \pi: & 2X_{\mu 1} + 2X_{\mu 2} \leq 11 \\ \delta & 4X_{\mu 1} + 2X_{\mu 2} \leq 5 \\ \varepsilon & X_{\mu 1} + 3X_{\mu 2} \leq 5 \\ \tau & X_{\mu 1}, X_{\mu 2} \geq 0 \end{array}$$

DUAL:

$$Y_1 = Availability\ of\ resource\ A$$

$$Y_2 = Availability\ of\ resource\ B$$

$$Y_3 = Availability\ of\ resource\ C$$

$$\begin{array}{ll} MIN & 11Y_1 + 5Y_2 + 5Y_3 \\ \alpha: & 2Y_1 + 4Y_2 + Y_3 \geq 3 \\ \beta: & 2Y_1 + 2Y_2 + 3Y_3 \geq 5 \\ \vartheta: & Y_{1,2,3} \geq 0 \end{array}$$

We can provide the following interpretation to the dual:

Having two variables greater or equal to 0 in the **Direct** implies that the first two constraint of the **Dual** are greater or equal to 0.

Having 3 constraints smaller or equal to 0 in the **Direct** implies that the 3 variables of the **Dual** are greater or equal to 0.