(063) Math 131: Finite Mathematics.Quiz II(6.4-5;7.4,7.8): Aug 04, 2007

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Contents

Marks: 35; Time: 30 Minutes

NAME:..

I.D.#:

NOTE: SHOW COMPLETE SOLUTION. Write simplified answer of each question.

Q.1. $(Marks : 10)$. (**146Anton4E**) . **Use Gauss-Jordan elimination Method (Method of Matrix Reduction:Reduced Row Echelon Form) only to solve the following system of linear equations:**

$$\begin{cases} 2x + y + z = 1 \\ 3x + 2y + z = 2 \\ 2x + y + 2z = -1 \end{cases}$$

Solution. The augmented matrix for this system is

x	y	z	:	*const.*
....	....	....	:	....
....	....	....	:	....
....	....	....	:	....

ROW OPERATIONS:

x	y	z	:	*const.*
....	....	....	:	....
....	....	....	:	....
....	....	....	:	....

ROW OPERATIONS:

x	y	z	:	*const.*
....	....	....	:	....
....	....	....	:	....
....	....	....	:	....

ROW OPERATIONS:

x	y	z	:	*const.*
....	....	....	:	....
....	....	....	:	....
....	....	....	:	....

ROW OPERATIONS:

x	y	z	:	*const.*
....	....	....	:	....
....	....	....	:	....
....	....	....	:	....

ROW OPERATIONS:

x	y	z	:	*const.*
....	....	....	:	....
....	....	....	:	....
....	....	....	:	....

$x =$ ...., $y =$ ...., $z =$ ....

Q.2.$(Marks : 6)\, 245Anton26.$ **Production Control. An oil company operates two refineries in a certain city. Refinery I has an oupput of** 200, 100, **and** 100 **barrels of low-, medium-, and high-grade oil per day, respectively. Refinery II has an ouput of** 100, 200, **and** 600 **barrels of low-, medium-, and high-grade oil per day, respectively. The company wishes to produce at least** 1000, 1400, **and** 3000 **barrels of low-, medium-, and high-grade oil to fill an order. If it costs** $\$200/day$ **to operate refinery**

I **and** \$ 300/day **to operate refinery** II**, determine how many days each refinery should be operated to meet the requirements of the order at minimum cost to the company. Set up the linear programming problem without solution.**

Answer. Let x = the number of days to operate refinery I.

Let y = the number of days to operate refinery II.

Objective Function: **Maximize Or Minimize Cost C (Check one)** $C =$ .....

subject to the constraints:

$$\begin{cases} \text{.....} & \leq or \geq \ (Check) & \text{.....} \\ \text{.....} & \leq or \geq \ (Check) & \text{.....} \\ \text{.....} & (\leq or \geq) \ (Check) & \text{.....} \\ x & \geq & 0 \\ y & \geq & 0 \end{cases}$$

Q.3.$(Marks: 13)\,.(587LH31)\,.$ **Use the SIMPLEX METHOD to solve the following problem.**

MAXIMIZE $P = 300x_1 + 200x_2 + 100x_3$

subject to the constraints:

$$\begin{cases} x_1 + x_2 + x_3 \leq 100 \\ 2x_1 + 3x_2 + 4x_3 \leq 320 \\ 2x_1 + x_2 + x_3 \leq 160 \\ x_1 \geq 0 \\ x_2 \geq 0 \\ x_3 \geq 0 \end{cases}$$

Solution.

$$\left[\begin{array}{cccccccc|c} x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & P & : & cnst \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ - & - & - & - & - & - & - & : & - \\ .... & .... & .... & ... & ... & ... & ... & : & .... \end{array}\right]$$

ROW OPERATIONS:

$$\left[\begin{array}{cccccccc|c} x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & P & : & cnst \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ - & - & - & - & - & - & - & : & - \\ .... & .... & .... & ... & ... & ... & ... & : & .... \end{array}\right]$$

ROW OPERATIONS:

$$\left[\begin{array}{cccccccc|c} x_1 & x_2 & x_3 & s_1 & s_2 & s_3 & P & : & cnst \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ & & & & & & & : & \\ .... & .... & .... & ... & ... & ... & ... & : & .... \\ - & - & - & - & - & - & - & : & - \\ .... & .... & .... & ... & ... & ... & ... & : & .... \end{array}\right]$$

Max $P =$ ....., $x_1 =$ ....., $x_2 =$ ....., $x_3 =$ .....

Q.4. $(Marks: 6)\,.(334BZ33)\,.$ **Write (Set up but do not solve) the DUAL Problem associated with the following problem:**

[Rewrite the given linear programming problem as a maximization problem with constraints involving inequalities of the form $\leq$ **(with the exception of the inequalities** $y_1 \geq 0, y_2 \geq 0,$ **and** $y_3 \geq 0$ **)]**

MINIMIZE $C = 16x_1 + 8x_2 + 4x_3$

subject to

$$\begin{cases} 3x_1 + 2x_2 + 2x_3 \geq 16 \\ 4x_1 + 3x_2 + x_3 \geq 14 \\ 5x_1 + 3x_2 + x_3 \geq 12 \\ x_1 \geq 0 \\ x_2 \geq 0 \\ x_3 \geq 0 \end{cases}$$

The Dual Form is the following Standard Maximum Problem:

OBJECTIVE FUNCTION:

MAXIMIZE OR MINIMIZE $(Check\ one)$
$G =$ .....

subject to the constraints:

$$\begin{cases} \text{.....} & \leq or \geq \ (Check) & ... \\ \text{.....} & \leq or \geq \ (Check) & ... \\ \text{.....} & \leq or \geq \ (Check) & ... \\ y_1 & \geq & 0 \\ y_2 & \geq & 0 \\ y_3 & \geq & 0 \end{cases}$$