(072) Math 131:Finite MathematicsQuizTest(7.4,7.8): June 04, 2008

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Contents

Marks: 40; Time: 30 Minutes

NAME:.....

I.D.#:

SERIAL# SECTION #: (check Se. 03)

		9	a	10	a	11	a
		2	m	03	m	04	m

NOTE: SHOW ALL STEPS OF THE SOLUTION.

NO CREDIT FOR ANSWERS WITHOUT COMPLETE SOLUTION.

The questions are not in any order of difficulty at all.

Only the nonprogramable calculators are allowed.

Write the simplified answer of each question at the end of each question.

Q.1. $(Marks: 10)$. (**Crop** Planning). A farmer has at most 200 acres of farmland suitable for cultivationg crops A, B, and C.

The costs for cultivating crops A, B, *and* C, are \$ 40, \$ 50, and \$ 30 per acre, respectively.

The farmer has a maximum of \$ 18000 avaiable for land cultivation.

Crops A, B, and C require 20, 30, and 15 hours per acre of labor, respectively,

and there is a maximum of 4200 hours of labor avaiable.

If the farmer expects to make a profit \$ 70, \$ 90, and \$ 50 per acre on crops A, B, and C, respectively,

how many acres of each crop should he plant in order to maximize his profit?

Set up the Standard Linear Programming Problem without Solution.

Let x = Number of acres of land for cultivation crop A.

Let y = Number of acres of land for cultivation crop B.

Let z = Number of acres of land for cultivation crop C.

OBJECTIVE FUNCTION: (Complete it).

MAXIMIZE Profit Function

$P =$ _____ $x +$_____ $y +$_____ z

subject to the constraints:

$$(A)\begin{cases} x + y + z \leq 200 \\ 20x + 30y + 15z \leq 18000 \\ 40x + 50y + 30z \leq 4200 \end{cases}$$

$$(B)\begin{cases} x + y + z \leq 200 \\ 20x + 30y + 15z \leq 18000 \\ 70x + 90y + 50z \leq 4200 \end{cases}$$

$$(C)\begin{cases} x + y + z \leq 4200 \\ 20x + 30y + 15z \leq 18000 \\ 40x + 50y + 30z \leq 200 \end{cases}$$

$$(D)\begin{cases} x + y + z \leq 200 \\ 30x + 20y + 15z \leq 4200 \\ 50x + 40y + 30z \leq 18000 \end{cases}$$

$$(E)\begin{cases} x + y + z \geq 200 \\ 20x + 30y + 15z \geq 4200 \\ 40x + 50y + 30z \geq 18000 \end{cases}$$

$$(E)\begin{cases} x + y + z \leq 200 \\ 20x + 30y + 15z \leq 4200 \\ 40x + 50y + 30z \leq 18000 \end{cases}$$

$$(F)\begin{cases} x + y + z \leq 200 \\ 20x + 30y + 15z \leq 18000 \\ 40x + 50y + 30z \leq 4200 \end{cases}$$

(N) None of the above choices is correct and the correct system of constraints:

$$\begin{cases} \_\_x + \_\_y + \_\_z \leq \_\_\_\_ \\ \_\_x + \_\_y + \_\_z \leq \_\_\_\_ \\ \_\_x + \_\_y + \_\_z \leq \_\_\_\_ \end{cases}$$

Q.2.$(Marks: 20)$. $(516BZ23)$. **Use the SIMPLEX METHOD to solve the following problem.**

MAXIMIZE $P = 4x_1 + 3x_2 + 2x_3$

subject to $\begin{cases} 3x_1 + 2x_2 + 5x_3 \leq 23 \\ 2x_1 + x_2 + x_3 \leq 8 \\ x_1 + x_2 + 2x_3 \leq 7 \\ x_1 \geq 0 \\ x_2 \geq 0 \\ x_3 \geq 0 \end{cases}$

Solution.

x_1	x_2	x_3	s_1	s_2	s_3	P	:	$cnst$
....	....	....	...	...	...	...	:	....
....	....	....	...	...	...	...	:	....
....	....	....	...	...	...	...	:	....
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....	....	....	...	...	...	...	:	....

ROW OPERATIONS:

x_1	x_2	x_3	s_1	s_2	s_3	P	:	$cnst$
....	....	....	...	...	...	...	:	....
....	....	....	...	...	...	...	:	....
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ROW OPERATIONS:

x_1	x_2	x_3	s_1	s_2	s_3	P	:	$cnst$
....	....	....	...	...	...	...	:	....
....	....	....	...	...	...	...	:	....
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ROW OPERATIONS:

x_1	x_2	x_3	s_1	s_2	s_3	P	:	$cnst$
....	....	....	...	...	...	...	:	....
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ROW OPERATIONS:

x_1	x_2	x_3	s_1	s_2	s_3	P	:	$cnst$
....	....	....	...	...	...	...	:	....
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ROW OPERATIONS:

x_1	x_2	x_3	s_1	s_2	s_3	P	:	$cnst$
....	....	....	...	...	...	...	:	....
....	....	....	...	...	...	...	:	....
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....	....	....	...	...	...	...	:	....

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

Q.3. $(Marks: 10)\,.\,(334BZ33)\,.$ **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:

MAXIMIZE $G =$ ....

subject to

$\begin{cases} \text{...} \leq \text{.........} \\ \text{...} \leq \text{.........} \\ \text{...} \leq \text{........} \\ y_1 \geq 0 \\ y_2 \geq 0 \\ y_3 \geq 0 \end{cases}$