AMERICAN UNIVERSITY OF BEIRUT
Suliman S. Olayan School of Business
DCSN 205 – Managerial Decision Making

Spring 2010-2011 Lab Test

April 19, 2011

This exam is administered in full observance of the Olayan School of Business Honor Code and the penalties it sets for violations of the standard of academic conduct. You are required to fully understand the code and to strongly adhere to it. In particular, mobile telephones, and computers of any shape or size are not allowed, except for those provided by the School. No questions, no comments, no borrowing, and no disturbance of the peace of any kind will be permitted or tolerated. You are required to stop working on the exam and hand it immediately when a proctor instructs you to do so. Any cheating or attempted cheating will subject the offender to a zero on the exam and a referral to the Student Affairs Committee for further penalties. Please, sign the following pledge.

"I fully understand and strongly adhere to the School of Business Honor Code. I vow to complete the exam on my own without giving or receiving help from anyone, and to adhere to the academic integrity standards reflected in the AUB student code of conduct."

Name: _____ ID: _____

Signature: _____ Section: _____

- This exam must be completed individually, including all work performed on the computer.

- No additional material may be used, including any previously created computer documents.

- Only Excel and Calculator may be used on the computer.

- Understanding of the instructions is part of the exam. No questions will be answered by an instructor. If in doubt, write your assumptions and continue solving.

- This exam has 9 questions, for a total of 27 points.

- You have 70 minutes to complete the exam.

- <u>Do not start the exam</u> (do not turn to the next page) until instructed to do so.

- Once you begin, it is your responsibility to check that your paper contains 5 pages.

The MiauMiau Store specializes in custom food products for cats and other household pets. MiauMiau has just received an order for 60 kg of cat food that should contain at least 16% protein, 14% fat, and 12% fiber. MiauMiau would like to mix the available ingredients such that the total cost of the mix is minimized. The percentages of each nutrient in the available ingredients, along with their cost per kg, are shown in the following table:

	Ingredient		
	Beef	Chicken	Rice
Protein (%)	18	18	10
Fat (%)	24	12	4
Fiber (%)	18	24	6
Cost ($/kg)	2.20	2.00	0.70

Your task is to solve the problem using linear programming. Assume fractional values of variables are feasible. Write answers to the following questions in the spaces provided.

1. Define all decision variables. Make sure to indicate the units of variable values. [3]

2. Write an objective function and explain its meaning briefly. [3]

3. Write all constraints and explain their meaning briefly. $\boxed{3}$

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4. Create a model of the problem in Excel and solve it using Excel Solver. Put your name and ID in the filename. Save the Excel file on a hard disk. After completing the whole test and submitting the test paper to the instructor, upload the Excel file on Moodle. $\boxed{3}$

5. Write the optimal solution and the optimal objective function value that were determined by the Excel Solver. Write an interpretation of the optimal solution. $\boxed{3}$

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6. Based on the sensitivity report, write whether the optimal solution would change if the cost of beef would decrease by $0.50. Explain your answer briefly. What effect would it have on the optimal objective function value?

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7. Using the sensitivity report, write how the optimal objective function value would change if the minimum required amount of fat increased by 4%. Explain your answer briefly. Would this change affect the optimal solution?

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8. Write a linear constraint to ensure that the mix contains at least 15% of vitamin, assuming that beef has 22% of vitamin, chicken has 20% of vitamin, and rice has 4% of vitamin. Decide without using Excel Solver whether the optimal solution would change or stay the same if this constraint were added to the model. Explain your answer briefly.

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9. Write below all necessary modifications of the mathematical model to ensure that either beef or chicken are used in the mix, but not both. Make sure that after modifications the model is an integer linear model. (Note: You do not have to implement the modified model in Excel.)

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