# ESCUELA SUPERIOR POLITECNICA DEL LITORAL

Administración de Operaciones
Examen Parcial
Term. I, 2019

*Yo, ……, al firmar este compromiso, reconozco que el presente examen está diseñado para ser resuelto de manera individual, que puedo usar una calculadora ordinaria para cálculos aritméticos, un lápiz o esferográfico; que sólo puedo comunicarme con la persona responsable de la recepción del examen; y, cualquier instrumento de comunicación que hubiere traído, debo apagarlo y depositarlo en la parte anterior del aula, junto con algún otro material que se encuentre acompañándolo. No debo además, consultar libros, notas, ni apuntes adicionales a las que se entreguen en esta evaluación. Los temas debo desarrollarlos de manera ordenada. Como estudiante de ESPOL me comprometo a combatir la mediocridad y actuar con honestidad, por eso no copio ni dejo copiar. Firmo al pie del presente compromiso, como constancia de haber leído y aceptar la declaración anterior.*

*Firma: …… Nro.Matrícula: ……*

*Paralelo: ……..*

Bayes Theorem: $P(A|B) = \frac{P(B|A)\cdot P(A)}{P(B|A)\cdot P(A)+P(B|A')\cdot P(A')}$

1.) Consider the different ways in which a firm can choose to compete. Fill in the blank with the appropriate term. (10 pts)

_____ is the ability of a firm to adjust to product mix, production volume, or design.

2.) Julia is the principal owner of J's Tees. At the present time, Julia is forced to consider purchasing some more equipment for her company due to competition. Her alternatives are shown in the following table:

| Equipment | Good Market | Bad Market |
|---|---|---|
| A | $100,000 | -$19,000 |
| B | $260,000 | -$22,000 |
| C | $410,000 | -$33,000 |

For example, if Julia purchases equipment A and if there is a good market, she will realize a profit of $100,000. On the other hand, if the market is bad, Julia will suffer a loss of $19,000. Julia read in a magazine that the demand for t-shirts is expected to be very high this year. One of the articles in her magazine states that the chances of a good market for t-shirts was 75%, while the chance of a bad market was only 25%. Julia would like to use these probabilities in determining the best decision.

a. What is her optimal decision and the corresponding EMV? (10pts)

b. Now, assume that she can pay a firm $50,000 to do a study to better know the demand for t-shirts. From historical data, she thinks that the probability that the firm correctly predicts a good market is 80% (that is, the probability of the survey predicting a good market given that the market was good is 80%) and the probability that the firm correctly predicts a bad market is 70%. Additionally, she thinks that the survey will predict a good market 75% of the time and a bad market 25% of the time. Draw a decision tree and show her best decision path and EMV's at every state-of-nature and decision nodes. All of these things must be present for full points. (30 pts)

3.) Holly is considering playing a game in which she must pay $20 to play. In this game, she can spin a wheel that has red and black sections. If it lands on a red section, she gets her $20 back plus an additional $20. If it lands on black, she gets nothing back. Holly says that she will only play the game if there is at least a 65% chance that she will win. If she doesn't play, she keeps her original $20. Which of the following is Holly? (10 pts)

a. Risk averse
b. Risk neutral (indifferent)
c. Risk loving

4.) What is the optimal solution for X, Y, and Z for the following linear programming problem? You must show the problem graphed for full points. (20 pts)

$$\min Z = 5X + 4Y$$
$$s.t.$$
$$X \geq 2$$
$$3X + 7Y \geq 13$$
$$X, Y \geq 0$$

5.) Clara would like to have a dinner party for her friends, but she doesn't want to spend too much. She wants to make sure to make at least 5 pounds of some meat, 3 pounds of some vegetables, and at least one pound of some dessert. For meats, she is considering making chicken, beef, or pork. Chicken costs $2.50 a pound, beef costs $3 a pound, and pork costs $2.75 a pound. For vegetables, she can choose between spinach salad at $0.50 per pound and tomato salad at $0.40. For dessert, she can choose between pecan pie at $4 per pound and chocolate cake at $3.50 per pound.

On the following page is the Excel Solver input and output.

a. The shadow price for the vegetable constraint is hidden in the output. (This hidden value is non-zero.) Explain/interpret what the shadow price for the vegetable constraint is telling us in the context of this problem. (10 pts)

b. What is the hidden shadow price value for the vegetable constraint? (Hint: You do not need to resolve the entire problem to find this number.) (10 pts)

| Variables | Chicken | Beef | Pork | Spinach | Tomato | Pie | Cake | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Values to Change | 1 | 1 | 1 | 1 | 1 | 1 | 1 | | | |
| Cost per unit | 2,5 | 3 | 2,75 | 0,5 | 0,4 | 4 | 3,5 | | | |
| | 2,5 | 3 | 2,75 | 0,5 | 0,4 | 4 | 3,5 | | | |
| | | | | | | | | | | |
| Total Cost | 16,65 | | | | | | | | | |
| st. | | | | | | | | | | |
| Total Meat | 1 | 1 | 1 | | | | | | >= | 5 |
| Total Vegetables | | | | 1 | 1 | | | | >= | 3 |
| Total Dessert | | | | | | 1 | 1 | | >= | 1 |
| | | | | | | | | | | |
| Total Meat | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 3 | >= | 5 |
| Total Vegetables | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | >= | 3 |
| Total Dessert | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | >= | 1 |

Celdas de variables

| Celda | Nombre | Final Valor | Reducido Coste | Objetivo Coeficiente | Permisible Aumentar | Permisible Reducir |
|---|---|---|---|---|---|---|
| $B$2 | Values to Change Chicken | 5 | 0 | 2,5 | 0,25 | 2,5 |
| $C$2 | Values to Change Beef | 0 | 0,5 | 3 | 1E+30 | 0,5 |
| $D$2 | Values to Change Pork | 0 | 0,25 | 2,75 | 1E+30 | 0,25 |
| $E$2 | Values to Change Spinach | 0 | 0,1 | 0,5 | 1E+30 | 0,1 |
| $F$2 | Values to Change Tomato | 3 | 0 | 0,4 | 0,1 | 0,4 |
| $G$2 | Values to Change Pie | 0 | 0,5 | 4 | 1E+30 | 0,5 |
| $H$2 | Values to Change Cake | 1 | 0 | 3,5 | 0,5 | 3,5 |

Restricciones

| Celda | Nombre | Final Valor | Sombra Precio | Restricción Lado derecho | Permisible Aumentar | Permisible Reducir |
|---|---|---|---|---|---|---|
| $I$12 | Total Meat | 5 | 2,5 | 5 | 1E+30 | 5 |
| $I$13 | Total Vegetables | 3 | | 3 | 1E+30 | 3 |
| $I$14 | Total Dessert | 1 | 3,5 | 1 | 1E+30 | 1 |