ESCUELA SUPERIOR POLITECNICA DEL LITORAL

Administracíon de Operaciones
Mejoramiento
Term. 1, 2017

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: ………………………...

1.) Mary is considering opening a new grocery store in town. She is evaluating three sites: downtown, the mall, and out at the busy traffic circle. Mary calculated the value of successful stores at these locations as follows: downtown, $250,000; the mall, $300,000; the circle, $400,000. Mary calculated the losses if unsuccessful to be $100,000 at either downtown or the mall and $200,000 at the circle. Mary figures her chance of success to be 50% downtown, 60% at the mall, and 75% at the traffic circle.

(a) Draw a decision tree for Mary and select her best alternative.
(b) Mary has been approached by a marketing research firm that offers to study the area to determine if another grocery store is needed. The cost of this study is $30,000. Mary believes there is a 60% chance that the survey results will be positive (show a need for another grocery store). SRP = survey results positive, SRN = survey results negative, SD = success downtown, SM = success at mall, SC = success at circle, SD = don't succeed downtown, and so on. For studies of this nature: $P(SRP|success) = 0.7$; $P(SRN|success) = 0.3$; $P(SRP|not\ success) = 0.2$ and $P(SRN|not\ success) = 0.8$. Calculate the revised probabilities for success (and not success) for each location, depending on survey results.
(c) How much is the marketing research worth to Mary? Calculate the EVSI.

2. Emarpy Appliance produces all kinds of major appliances. Richard Feehan, the president of Emarpy, is concerned about the production policy for the company's best selling refrigerator. The demand for this has been relatively constant at about 8,000 units each year. The production capacity for this product is 200 units per day. Each time production starts, it costs the company $120 to move materials into place, reset the assembly line, and clean the equipment. The holding cost of a refrigerator is $50 per year. The current production plan calls for 400 refrigerators to be produced in each production run. Assume there are 250 working days per year.

(a) What is the daily demand of this product?
(b) If the company were to continue to produce 400 units each time production starts, how many days would production continue?
(c) Under the current policy, how many production runs per year would be required? What would the annual setup cost be?
(d) If the current policy continues, how many refrigerators would be in inventory when production stops? What would the average inventory level be?
(e) If the company produces 400 refrigerators at a time, what would the total annual setup cost and holding cost be?

3. Consider the following four LP formulations. Using a graphical approach, determine:

(a) which formulation has more than one optimal solution.
(b) which formulation is unbounded.
(c) which formulation has no feasible solution.
(d) which formulation is correct as is.

Formulation 1

$$\begin{aligned} \text{Maximize } & 10X_1 + 10X_2 \\ \text{subject to } & 2X_1 \le 10 \\ & 2X_1 + 4X_2 \le 16 \\ & 4X_2 \le 8 \\ & X_1 = 6 \end{aligned}$$

Formulation 3

$$\begin{aligned} \text{Maximize } & 3X_1 + 2X_2 \\ \text{subject to } & X_1 + X_2 \ge 5 \\ & X_1 \ge 2 \\ & 2X_2 \ge 8 \end{aligned}$$

Formulation 2

$$\begin{aligned} \text{Maximize } & X_1 + 2X_2 \\ \text{subject to } & X_1 \le 1 \\ & 2X_2 \le 2 \\ & X_1 + 2X_2 \le 2 \end{aligned}$$

Formulation 4

$$\begin{aligned} \text{Maximize } & 3X_1 + 3X_2 \\ \text{subject to } & 4X_1 + 6X_2 \le 48 \\ & 4X_1 + 2X_2 \le 12 \\ & 3X_2 \ge 3 \\ & 2X_1 \ge 2 \end{aligned}$$

4.) Dream Team Productions was in the final design phases of its new film, *Killer Worms*, to be released next summer. Market Wise, the firm hired to coordinate the release of *Killer Worms* toys identified 16 critical tasks to be completed before the release of the film.

(a) How many weeks in advance of the film release should Market Wise start its marketing campaign? What are the critical path activities? The tasks are as follows:

ACTIVITY	IMMEDIATE PREDECESSOR	OPTIMISTIC TIME	MOST LIKELY TIME	PESSIMISTIC TIME
Task 1	—	1	2	4
Task 2	—	3	3.5	4
Task 3	—	10	12	13
Task 4	—	4	5	7
Task 5	—	2	4	5
Task 6	Task 1	6	7	8
Task 7	Task 2	2	4	5.5
Task 8	Task 3	5	7.7	9
Task 9	Task 3	9.9	10	12
Task 10	Task 3	2	4	5
Task 11	Task 4	2	4	6
Task 12	Task 5	2	4	6
Task 13	Tasks 6, 7, 8	5	6	6.5
Task 14	Tasks 10, 11, 12	1	1.1	2
Task 15	Tasks 9, 13	5	7	8
Task 16	Task 14	5	7	9

b.) If Tasks 9 and 10 were not necessary, what impact would this have on the critical path and the number of weeks needed to complete the marketing campaign?