

- [10] 7. An economy is based on the three sectors: agriculture, energy and manufacturing. Production of one dollar's worth of agriculture requires an input of \$0.20 from agriculture and \$0.40 from energy. Production of one dollar's worth of energy requires an input of \$0.10 from energy and \$0.20 from manufacturing. Production of one dollar's worth of manufacturing requires an input of \$0.40 from agriculture, \$0.20 from energy and \$0.20 from manufacturing.
- (A) Write the technological matrix  $M$  for this economy.
- (B) If a final demand of \$30 billion for agriculture, \$10 billion for energy, and \$20 billion for manufacturing is to be met, then set up the equation to be satisfied by the inputs from the respective sectors.
- (C) Solve the respective inputs satisfying these demands.

- [10] 8. Extremize  $P(x, y) = 20x + 30y$  subject to

$$2x + y \leq 20, \quad 10x + y \geq 36, \quad 2x + 5y \geq 36, \quad x \geq 0, \quad y \geq 0.$$

- [10] 9. The 14 colleges of interest to a high school senior include 6 that are expensive (tuition more than \$20,000 per year), 7 that are far from home (more than 200 miles away), and 2 that are both expensive and far from home.
- (A) If the student decides to select a college that is not expensive and within 200 miles of home, how many selections are possible?
- (B) If the student decides to attend a college that is not expensive and within 200 miles from home during his first two years of college, and then will transfer to a college that is not expensive but is far from home, how many selections of two colleges are possible?
- [10] 10. A large computer company  $A$  subcontracts the manufacturing of its circuit boards to two companies: 40% to company  $B$  and 60% to company  $C$ . Company  $B$  in turn subcontracts 70% of the orders it receives from company  $A$  to company  $D$  and the remaining 30% to company  $E$ , both subsidiaries of company  $B$ . When the boards are completed by companies  $D$ ,  $E$ , and  $C$ , they are shipped to company  $A$  to be used in various computer models. It has been found that 1.5%, 1%, and 0.5% of the boards from  $D$ ,  $E$ , and  $C$ , respectively, prove defective during the 3 year warranty period after a computer is first sold.
- (A) What is the probability that a given board in a computer will be defective during the 3 year warranty period?
- (B) What is the probability that a circuit board in a completed computer came from company  $E$  or  $C$ ?