TUGAS RISET OPERASI 2

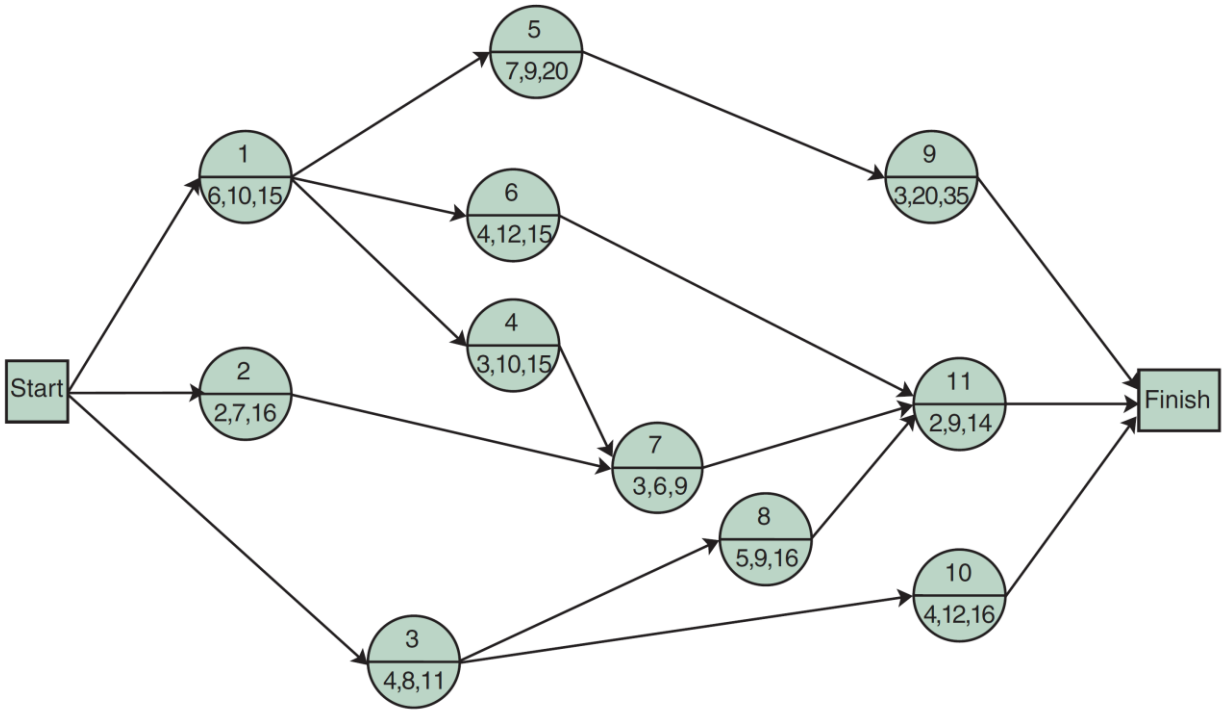
1. Consider the following linear programming model:

$$\begin{aligned} &\text{maximize } Z = 5x_1 + 4x_2 \\ &\text{subject to} \\ &3x_1 + 4x_2 \leq 10 \\ &\qquad x_1, x_2 \geq 0 \text{ and integer} \end{aligned}$$

Demonstrate the graphical solution of this model.

2. Lauren Moore has sold her business for $500,000 and wants to invest in condominium units (which she intends to rent) and land (which she will lease to a farmer). She estimates that she will receive an annual return of $8,000 for each condominium and $6,000 for each acre of land. A condominium unit costs $70,000, and land costs $30,000 per acre. A condominium will cost her $1,000 per unit, an acre of land will cost $2,000 for maintenance and upkeep, and $14,000 has been budgeted for these annual expenses. Lauren wants to know how much to invest in condominiums and land to maximize her annual return.
   a. Formulate a mixed integer programming model for this problem.
   b. Solve this model by using the computer.

3. Given the following network and activity time estimates, determine the expected time and variance for each activity and indicate the critical path:



4. A farmer in the Midwest has 1,000 acres of land on which she intends to plant corn, wheat, and soybeans. Each acre of corn costs $100 for preparation, requires 7 worker-days of labor, and yields a profit of $30. An acre of wheat costs $120 to prepare, requires 10 worker-days of labor, and yields $40 profit. An acre of soybeans costs $70 to prepare, requires 8 worker-days, and yields $20 profit. The farmer has taken out a loan of $80,000 for crop preparation and has contracted with a union for 6,000 worker-days of labor. A midwestern granary has agreed to purchase 200 acres of corn, 500 acres of wheat, and 300 acres of soybeans. The farmer has established the following goals, in order of their importance:
   (1) To maintain good relations with the union, the labor contract must be honored; that is, the full 6,000 worker-days of labor contracted for must be used.
   (2) Preparation costs should not exceed the loan amount so that additional loans will not have to be secured.
   (3) The farmer desires a profit of at least $105,000 to remain in good financial condition.
   (4) Contracting for excess labor should be avoided.
   (5) The farmer would like to use as much of the available acreage as possible.
   (6) The farmer would like to meet the sales agreement with the granary. However, the goal should be weighted according to the profit returned by each crop.
   a. Formulate a goal programming model to determine the number of acres of each crop the farmer should plant to satisfy the goals in the best possible way.
   b. Solve this model by using the computer.

5. The Dynaco Manufacturing Company produces a particular product in an assembly line operation. One of the machines on the line is a drill press that has a single assembly line feeding into it. A partially completed unit arrives at the press to be worked on every 7.5 minutes, on average. The machine operator can process an average of 10 parts per hour. Determine the average number of parts waiting to be worked on, the percentage of time the operator is working, and the percentage of time the machine is idle.

6. McBurger's fast-food restaurant has a drive-through window with a single server who takes orders from an intercom and also is the cashier. The window operator is assisted by other employees who prepare the orders. Customers arrive at the ordering station prior to the drive-through window every 4.5 minutes (Poisson distributed), and the service time is 2.8 minutes (exponentially distributed). Determine the average length of the waiting line and the waiting time. Discuss the quality of the service.