Indian Institute of Technology, Kharagpur
Department of Industrial & Systems Engineering
Spring 2022-23
IM 29204: Operations Research Laboratory
L-T-P : 0-0-3, Credits - 2

Lab Assignment – 1

Maximum Marks: 20

Instructions :

1. Attempt **all Questions**.
2. All questions carry **equal** marks.
3. Assume any missing data suitably and state all your assumptions clearly.
4. You need to make this submission via **MS teams**.
5. The usage of **mobile phones** and **internet** during the lab hours is **strictly prohibited** unless specially instructed.
6. Write your name and roll number inside the file. Name your file as: Your Name_Roll No. For example, if your name is Ravi and Roll No. is 10IM9999, then you should name your file as: **Ravi_10IM9999**
7. Submission Deadline – The file must be submitted during the lab hours. **Assignments submitted after due date and time will NOT be evaluated.**
8. Do not submit multiple files for same assignment. In case of multiple files compress them in one ".zip" file and then submit.

Q1. A company produces two products, A and B. The sales volume for A is at least 80% of the total sales of both A and B. However, the company cannot sell more than 110 units of A per day. Both products use one raw material, of which the maximum daily availability is 300 lb. The usage rates of the raw material are 2 lb per unit of A, and 4 lb per unit of B. The profit units for A and B are $40 and $90, respectively. Determine the optimal product mix for the company. Solve the model using Excel Solver.

Q2. Alumco manufactures aluminum sheets and aluminum bars. The maximum production capacity is estimated at either 800 sheets or 600 bars per day. The maximum daily demand is 550 sheets and 560 bars. The profit per ton is $40 per sheet and $35 per bar. Determine the optimal daily production mix. Solve the model using Excel Solver.

Q3. Top Toys is planning a new radio and TV advertising campaign. A radio commercial costs $300 and a TV ad costs $2000. A total budget of $20,000 is allocated to the campaign.

However, to ensure that each medium will have at least one radio commercial and one TV ad, the most that can be allocated to either medium cannot exceed 80% of the total budget. It is estimated that the first radio commercial will reach 5000 people, with each additional commercial reaching only 2000 new ones. For TV, the first ad will reach 4500 people, and each additional ad an additional 3000. How should the budgeted amount be allocated between radio and TV? Solve the model using Excel Solver.

Q4. A furniture company manufactures desks and chairs. The sawing department cuts the lumber for both products, which is then sent to separate assembly departments. Assembled items are sent to the painting department for finishing. The daily capacity of the sawing department is 200 chairs or 80 desks. The chair assembly department can produce 120 chairs daily, and the desk assembly department 60 desks daily. The paint department has a daily capacity of either 150 chairs or 110 desks. Given that the profit per chair is $50 and that of a desk is $100, determine the optimal production mix for the company. Solve the model using Excel Solver.

Q5. An industrial recycling center uses two scrap aluminum metals, A and B, to produce a special alloy. Scrap A contains 6% aluminum, 3% silicon, and 4% carbon. Scrap B has 3% aluminum, 6% silicon, and 3% carbon. The costs per ton for scraps A and B are $100 and $80, respectively. The specifications of the special alloy require that (1) the aluminum content must be at least 3% and at most 6%, (2) the silicon content must be between 3% and 5%, and (3) the carbon content must be between 3% and 7%. Determine the optimum mix of the scraps that should be used in producing 1000 tons of the alloy. Solve the model using Excel Solver.