**Computational Science and Numerical Analysis**

1. **Classroom Resource Allocation**

Decision Variables:

Let

x, y, and z be the number of courses X, Y, and Z offered, respectively.

Objective Function:

Maximize the overall student enrollment:

Maximize

50+40+30

Maximize 50x+40y+30z

Constraints:

Classroom space constraint: The total classroom space used by all courses cannot exceed the available classrooms.

2x+3y+z≤5

Teaching assistant constraint: The total number of teaching assistants used by all courses cannot exceed the available assistants.

x+2y+z≤4

Non-negativity constraints:

x≥0,y≥0,z≥0

1. **Factory production resource allocation**

Decision Variables:

Let x, y, and z be the number of units of Product X, Product Y, and Product Z produced, respectively.

Objective Function:

Maximize the daily profit:

Maximize

10+15+12

Maximize 10x+15y+12z

Constraints:

Labor constraint: The total labor hours used by all products cannot exceed the available labor hours.

2x+3y+z≤100

Raw materials constraint: The total raw materials used by all products cannot exceed the available raw materials.

x+2y+1.5z≤50

Machine hours constraint: The total machine hours used by all products cannot exceed the available machine hours.

x+2y+z≤60

Non-negativity constraints:

x≥0,y≥0,z≥0

1. **Agriculture Produce Optimization**

Decision Variables:

Let x be the number of hectares of barley and y be the number of hectares of swedes.

Objective Function:

Maximize the total profit:

Maximize

100+120

Maximize 100x+120y

Constraints:

Land constraint: The total area of barley and Swedes cannot exceed the available land.

x+y≤20

Budget constraint: The total cost of barley and Swedes cannot exceed the budget.

30x+20y≤480

Man-days constraint: The total man-days used by barley and Swedes cannot exceed the available man-days.

x+2y≤36

Non-negativity constraints:

x≥0,y≥0

1. **Distribution**

Decision Variables:

Let x be the number of large vans and y be the number of small vans.

Objective Function:

Minimize the total cost:

Minimize 40x+20y

Constraints:

Package constraint: The total number of packages transported by large and small vans cannot exceed 1200.

200x+80y≥1200

Budget constraint: The total cost of using large and small vans cannot exceed £300.

40x+20y≤300

Non-negativity constraints:

x≥0,y≥0

Relationship between large and small vans: The number of large vans must not exceed the number of small vans.

x≤y

1. **Manufacturing and Production**

Decision Variables:

Let x be the quantity of the first type of scrap metal (in kg) and y be the quantity of the second type of scrap metal (in kg).

Objective Function:

Minimize the total cost:

Minimize 120x+160y

Constraints:

Metal A constraint: The total quantity of metal A in the purchased scraps must be at least 240 kg.

0.30x+0.40y≥240

Metal B constraint: The total quantity of metal B in the purchased scraps must be at least 100 kg.

0.20x+0.10y≥100

Metal C constraint: The total quantity of metal C in the purchased scraps must be at least 290 kg.

0.50x+0.30y≥290

Non-negativity constraints:

x≥0,y≥0