

Instructions:

Solve the given problems and submit the code and report. Prepare different submission files for Part I and Part II of the exam.

You are free to consult your previous exercises. Discussion with your friends and TAs is not allowed. Write all answers on your own. Clearly state your assumptions. No clarification will be provided. Copied answers will lead to severe penalization for all students involved.

End-sem exam question: [15 Marks]

Vishwas Homes is developing 20 acres in a new community in the Navi Mumbai area. There are four home types it can build on each lot, and Vishwas Homes must satisfy three requirements: at least 40 are to be one story homes; at least 50 homes need to have three or more bedrooms; and there are to be at least 10 of each home type. Vishwas Homes estimates the following gross profits:

Home Type	Lot size (in acre)	Stories (Num. floors)	Bedrooms	Profit
Serene	.20	1	2	₹400,000
Sea View	.27	1	3	₹500,000
La Villa	.22	2	4	₹600,000
Grand Marine	.35	2	5	₹800,000

1. Formulate the problem as an integer linear programming model and solve for Vishwas Homes' optimal construction of homes in this community. Report the model and solution.
2. Find the solution when the variables are not restricted to be integers. Report the solution.
3. Round the solution obtained in Question 2 to an integer point. Is it feasible? How much lower is the optimal profit of the rounded solution than the optimal integer solution found in Question 1?
4. Assume that a minimum of 12 homes must be built for at least three of the four home types. Modify the model to reflect this new condition and solve for the new optimal distribution of homes for the Vishwas Homes project.