

## Semester Project – Section B

**This problem statement is only for section B students**

### Problem Statement

A soft drink manufacturer requires services of your software house to automate the process of can designing. The available material for the bottom and top of the can cost  $20\text{cents}/\text{cm}^2$ , and for the sides the material cost is  $10\text{cents}/\text{cm}^2$ . The company is considering two design options; one design does not include the lid and is an open top design, and the other design includes the lid and thus is a closed top design.

The company wants your software house to provide them with a MATLAB code which will take desired volume, and design (open top or closed top) as input and give dimensions and surface area of the can that will result in the minimum cost as output for the specified volume and design. To test your code the company has asked you to use  $275\text{cm}^3$  as volume for both designs. Furthermore, if the budget of the company is \$2 million, how many cans of the required design will the company be able to make?

### Program requirements

1. On (every) first run, the program must display name of your software house, and your programming team along with student ids.
2. At this stage, a message should be displayed to press any key to continue.
3. The program should ask the user about the required design (open or closed top) and desired volume.
4. The program should apply the optimization technique learnt in class to find the solution. Relevant MATLAB commands should be used to find derivative and solution of the problem. Using the final equations obtained through by-hand solution will not result in any marks.
5. The dimensions of the can and minimum cost should be displayed as output. The total number of cans that the company will be able to make in its budget should also be displayed.
6. At this stage, the program must ask the user if they wish to run another query or terminate the program. Based on user input, program must act accordingly.

## Report Requirements

Students are required to submit a complete report of the project prepared in MS Word in their own words, including:

Sr. No.	Deliverable	Marks
1.	Objectives and introduction of the problem.	5
2.	A step-by-step by-hand solution. Clearly state the assumptions and values that you use for the solution.	15
3.	A well commented MATLAB code with line-by-line explanation. This part must include the explanation of the commands, functions, and toolboxes used.	10
4.	A step-by-step example demonstrating the MATLAB solution. Also provide an instruction's manual to run the MATLAB program to obtain the MATLAB solution demonstrated in the example.	10
5.	Detailed results section. Present results and graphs of your analytical and MATLAB solution in this section, compare and discuss your results including their physical interpretation.	10
6.	Flowchart of the solution methodology.	5
7.	3D figure of the open top design.	5
8.	Conclusions. In this section include conclusions related to this project, summary of problem and results, the difficulties that you faced during this project and how you overcame those difficulties.	5
9.	Contribution. In this section clearly state the contribution of each group member. Generic statements such as 'each group member contributed equally' are not acceptable answers.	5

Each report element should be documented under a separate heading. Report must not exceed 12 A4 size pages including table of contents as well as a single title page with project title, student names, ids, section, and name of the course. 3 marks will be deducted from obtained marks for every extra page. Each page should be numbered. The report should be written in Calibri or Times New Roman typeface only. The size of the font should be 12. The size of first and second level of headings should be 14 bold, and 12 bold, respectively. The alignment of the report should be justified, while pictures and tables should be center aligned with relevant

captions. The option to align the text left, right, center, and justify can be found under paragraph options on *Home* tab. Line and paragraph spacing should be set as 1.5.

### Project Submission Guidelines

This project is an open-ended problem designed to demonstrate the application of differentiation and optimization in real life. The open-ended nature of the problem means that this problem can be solved in more than one way using various techniques and methodologies, some of these techniques have been covered in this course. You are free to adopt any technique and solution methodology to solve this problem. Solution techniques and methodologies that are not part of the course outline can also be used to solve the problem. However, you are required to take approval of such a solution technique before starting the project. You will have to do extensive research to completely solve the problem. Project guidelines are summarized below:

- This is a group project and carries 70 marks.
- A group can have maximum of 3 students. One of the aims of this project is to enable students to work effectively in a team. Therefore, this project cannot be done individually.
- Plagiarized work (from internet or fellow students) will result in zero marks.
- Deadline for complete project submission of hardcopy and on [google classroom](#) (one MS Word file and one pdf of the same Word file including all the codes and by-hand solutions) is **Friday 10 December 2021 before 04:30pm**. Do not submit your project in a .zip or .rar format. You can submit additional files such as .m files, however, the single PDF and MS Word file must also include all these files.
- Name of your project report file must be as per following format:  
**ID1\_ID2\_ID3\_MT1003\_Project\_Section.**  
(e.g., 123456\_654321\_987654\_MT1003\_Project\_B)
- Do not submit your project via email, it will not be considered.
- Late submissions will not be considered.