

**Complex Engineering Problem # 1**

Student Name: \_\_\_\_\_

CMS ID: \_\_\_\_\_

Batch: \_\_\_\_\_

Due Date: 24<sup>th</sup> August, 2022**Problem Description:****Design of Race Car Engine**

You have been hired by a new company that aims to develop state-of-the-art race cars. You will be working in the engine design division of the company. The manager of the engine division has assigned a task to all new coming engineers to propose a design of a race car engine with certain constraints while also considering the current technological and market trends. As per the constraints provided by the company, the engine has to be a six-liter engine and should operate on four-stroke cycle. You are required to decide what the design speed will be, why are you choosing this design speed, and how it relates to current market trends. Once you have the design speed you are required to give values of different parameters such as the number of cylinders, bore, stroke, piston rod length, average piston speed, imep, brake torque, fuel used, AF, emission index, and brake power etc. all at design speed. All parameter values should be within typical, reasonable ranges and should be consistent with the other values. State what assumptions you make (e.g., mechanical efficiency, volumetric efficiency, etc.). In the second phase, you are required to conduct the thermodynamic analysis of your designed engine and report the indicated as well as the actual efficiency of the engine.

**Note:** State all your assumptions clearly and provide computer code if any programming is used. Considering varying/multiple design speeds to optimize engine performance is a plus.

#	Attribute	Unsatisfactory 0 – 0.5	Satisfactory 0.5 – 2	Exceeds Expectations 2 – 2.5	CLO	PLO	Taxonomy Level	Score
1	Problem definition	Incapable of effectively understanding problem statement, its constraints, and deliverables.	Demonstrates the ability to understand the problem statement, its constraints, and deliverables.	Constructs complete problem identification with a thorough discussion on problem constraints and their deliverables.	3	2	C3	
2	Identification of methods of IC Engine design	Is not able to identify the relevant design procedure.	Able to identify relevant methods and doesn't recognize the limitation of the methods.	Identifies the relevant methods and tools. Discusses some methods/tools and recognizes the limitation of the methods.	2	1	C1	
3	Implements the relevant standard/procedure	Is not able to implement the standard design procedure and cannot calculate required deliverables.	Demonstrates the ability to implement the relevant procedure with minor mistakes and can calculate required parameters	Implements the relevant procedure/method perfectly. Is able to decide design speed and calculate relevant parameters	3	3	C3	
4	Analysis/Investigation/Results	Does not follow the standard procedure of analysis and investigation. Does not provide any concrete results.	Analysis and investigations are carried out methodically. Variation in design parameters is not considered while concluding.	Analysis and investigations are carried out methodically. Effective conclusions have been derived from the results with comments on different parameters.	5	4	C4	
					<b>Total (Out of 10)</b>			