POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH

LAWN-TECH

NAMA	NO.MATRIK
MOHAMAD ALIF HAIKAL BIN ABD HALIM	08DKM19F1144
MUHAMAD SYAHROZIKRY BIN MOHD SAMSOL SHAH	08DKM19F1137
NORHAFIZ BIN SHAHARI	08DKM19F1260

This report is submitted to the Department of Mechanical Engineering in partial fulfilment of the requirements for Diploma in Mechanical Engineering

MECHANICAL ENGINEERING DEPARTMENT

DECEMBER 2020

DECLARATION OF ORIGINAL WORK AND INTELLECTUAL PROPERTIES

TITLE : LAWN-TECH

SESSION : DECEMBER 2020

1. MOHAMAD ALIF HAIKAL BIN ABD HALIM (08DKM19F1144.)
2. MUHAMAD SYAHROZIKRY BIN MOHD SAMSOL SHAH (08DKM19F1137)
3. NORHAFIZ BIN SHAHARI (08DKM19F1260)

is a final year student in Diploma in Mechanical Engineering, Mechanical Engineering Department, Politeknik Sultan Salahuddin Abdul Aziz Shah, of Persiaran Usahawan, 40150 Shah Alam, Selangor. (Hereafter referred to as "the Polytechnic").

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NAME: MOHAMAD ALIF HAIKAL BIN ABD HALIM (IC No:010814-06-004)
NAME: MUHAMAD SYAHROZKRY BIN MOHD SAMSOL SHAH
(IC No: 010725-05-0531)
NAME: NORHAFIZ BIN SHAHARI (IC No: 010429-02-0039)

In front of me, SALHANA BINTI SAHIDIN@SALEHUDIN
(LECTURER IC) 760228-01-6116
as the project supervisor on the date: …….

ACKNOWLEDGEMENT

We would like to thank you for the help and responsibility that has been given by each member of the group. Therefore, thank you to Puan Salhana Binti Sahidin @ Salehudin for teaching and guiding us throughout this activity.

There is a lot of useful knowledge we have learned and we are confident that each of this knowledge will definitely be useful for us in the future.

ABSTRACT

This project is applied from observation based on the manual method used now which is to save time when mowing the lawn. The objective of this project produced is to design a machine capable of mowing the lawn in a short time for users who have a suitable home yard. Furthermore, there are several scopes of study that have been set in this project namely, mowing the lawn at a set time, designing machines that work using existing resources and designing tools that are able to compete with existing manual techniques. All these are set to solve some problems that arise with the use of existing methods such as the difficulty of completing the cutting activity in a certain time because the time taken is too long and the safety factor is less because injuries can be caused by stone splashes. The material for this project must also have special characteristics that are not rusty and do not affect the environment and users, based on the literature review conducted steel and aluminium are the most suitable for this project. While for the component formation process, the methodological study is used to plan the project production process by using flow charts as a guide for production planning and project testing. As a result, the whole project was successfully produced with an average time-saving rate compared to traditional methods. Based on these results, the results of the analysis and discussions that have been conducted, it can be concluded that this lawn mower has achieved the objectives that have been discussed. In addition, this tool has also been proven to save time compared to traditional methods.

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INTRODUCTION

1.1 Introduction

The lawnmower(additionally referred to as mower, grass cutter or lawnmower) is a system making use of one or extra revolving blades to reduce a grass floor to an excellent top. The top of the reduced grass can be constant via way of means of the layout of the mower, however normally is adjustable via way of means of the operator, usually via way of means of an unmarried grasp lever, or via way of means of a lever or nut and bolt on every of the system's wheels. The blades can be powered via way of means of guide force, with wheels automatically related to the slicing blades so that after the mower is driven forward, the blades spin or the system might also additionally have a battery-powered or plug-in electric powered motor.

1.2 Research Background

Users of normal brush cutters cannot mow the grass effectively and it takes time to do the mowing. A conventional mowing machine has a detrimental effect on the user's body because the brush cutter is heavy and results in back pain, low back pain, especially for elderly users or the elderly who are helpless. Difficult to handle because it is too heavy. Therefore, a strategy to this hassle ought to be carried out.

The research was obtained from a government source, 'guidelines and safety of lawn machine operation 2018' as in Table 1.1.

Table 1.1

Number	Hazard	explanation	solution
1	Ergonomic	1. lifting heavy loads and inappropriate positions 2. vibration from the machine operated by the lawn machine user	1. do not lift heavy machinery and equipment privately 2. install vibration absorbers on the machine used

1.3 Problem Statement

Brush cutters cannot mow the grass effectively and takes time. Conventional mowing machine has a detrimental effect on the user's body due to heavyweight will result in upper and lower back pain. Conventional mowing machine gives difficulty for elderly users to operate because the weight is significant compared to Lawn-Tech.

1.4 Research Gap

The current lawn mower shows that the handle cannot be adjusted to be higher or lower according to the comfort of the user. It is because users have different heights and require different handler heights according to suitability.

1.5 Research Objectives

Implementing this project have set some key objectives to be achieved. This is to ensure that our project follows the desired criteria. Among the objectives studied are as follows:

i. To design the ergonomically friendly lawn mower.

ii. To develop and fabricate the lawn mower (Lawn-Tech).

iii. To minimize the weight of Lawn-Tech.

1.6 Significance of study

The machine can prevent injuries such as back pain and low back pain. The way to use this Lawn Mower is easier than a normal brush cutter because this Lawn Mower is equipped with tires to smooth the movement.

1.7 Scope and limitations

i. The lawn mower (Lawn-Tech) will use the ‘pull starter’ method to start the machine.

ii. Suitable for outdoor yard or farm around (1076m2)

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The first garden mower changed into invented with the aid of using Edwin Budding in 1827 in Thrupp, simply outside Stroud, in Gloucestershire. Budding's mower changed into designed normally to reduce the garden on sports activities grounds and luxurious gardens, as an advanced opportunity to the scythe, and changed into patented in 1830. It took ten greater years and in addition improvements to create a gadget that might be laboured with the aid of using animals, and sixty years earlier than a steam-powered garden mower changed into built. In an settlement between John Ferrabee and Edwin Budding dated May 18, 1830, Ferrabee paid the charges of development, acquired letters of patent and bought rights to manufacture, promote and license different producers withinside the manufacturing of garden mowers. [2]

2.2 Theory/Concept

There are many distinctive forms of garden machines with inside the global today. But now no longer all are appropriate for humans and ground. Some heavy and hard manipulate gadgets will have an effect on the reducing job.

The following are the existing lawn machines in this world:

i. Cylinder or reel mowers

Figure 2.1 cylinder or reel lawn mower

Figure 2.1 shows a cylinder or reel lawn mower used today. A cylinder mower or reel mower includes a fixed, horizontal slicing blade on the preferred top of reducing. Over that is a fast-spinning reel of blades that pressure the grass beyond the slicing bar. Each blade withinside the blade cylinder paperwork a helix across the reel axis, and the set of spinning blades describes a cylinder.

Of all of the mowers, a nicely adjusted cylinder mower makes the cleanest reduction of the grass, and this lets the grass heal greater quickly. The reduction of a well-adjusted cylinder mower is directly and definite, as though reduce with a couple of scissors. This smooth reduction is greater effective, thicker and greater resilient garden increase this is greater proof against disease, weeds and parasites. Lawn reduction with a cylinder mower is much less possibly to bring about yellow, white or brown discolouration because of leaf shredding. While the slicing movement is regularly likened to that of scissors, it isn't always vital for the blades of the spinning cylinder to touch the horizontal slicing bar. If the space among the blades is much less than the thickness of the grass blades, a smooth reduction can nevertheless be made. If greater, however, the grass will slip through. Reel mowers additionally have greater trouble mowing over choppy terrain

ii. Rotary mower

Figure 2.2 rotary mower

A rotary mower rotates about a vertical axis with the blade spinning at high pace counting on effect to reduce the grass. This has a tendency to bring about a rougher reduce and bruises and shreds the grass leaf resulting in discolouration of the leaf ends because the shredded element dies.

The most important components of a mower are:

Blade : Consists of numerous (three to 7) helical blades which might be connected to a rotating shaft. The blades rotate, growing a scissor-like slicing movement towards the mattress knife.

Bed knife: The desk bound slicing mechanism of a mower. This is a set horizontal blade this is set up to the body of the mower.

Body body: The most important structural body of the mower onto which the alternative components of the mower are set up.

Wheels: Help propel the mower in action. Generally, reel mowers have wheels.

Push deal with: The "energy supply" of a operated by hand reel mower. This is a strong T-shaped, rectangular, or trapezoidal deal with this is linked to the body, wheels and blade chamber.

Motor: The energy supply of a reel mower this is powered with the aid of using gas or electricity.

iii. Lawn mower also can be categorized by energy source

1. Gasoline (petrol)

Extensive grass trimming was not common before the widespread application of the vertical shaft single cylinder gasoline/petrol engine.

2. By electricity

Electric mowers are further subdivided into corded and cordless electric models. Both are relatively quiet, typically producing less than 75 decibels, while a gasoline lawn mower can be 95 decibels or more.

2.3 Existing concepts

2.3.1 Concept 1

A powered lawn or agricultural device used to trim weeds, small trees, and different foliage is now no longer reachable via way of means of a garden mower or rotary mower. Various blades or trimmer heads may be connected to the device for precise applications. Figure 2.1 shows Cutting grass device/garden mower

Figure 2.1 lawn mower

2.3.2 Concept 2

The manage used is prepared with an engine shut-off switch. The manner to apply this gadget isn't always clean because of the gadget layout issue that's much less cushy for humans. A lot of power is needed to apply it. Figure 2.2 suggests a brush cutter.

figure 2.2 brush cutter

2.3.3 Concept 3

A big and really green device for a big area. Also can accelerate the reduction process. The device is geared up with tires that facilitate movement. But too big and heavy for use. Figure 2. three indicates a traditional Riding lawnmower.

Figure 2.3 conventional riding lawn mower

CHAPTER 3

METHODOLOGY

3.1 Introduction

In a project, the methodology is something that important to ensure that the project runs systematically and smoothly also can be completed within the stipulated time. Based on the lesson learned, each project planning should be completed within the allotted time. Figure 3.1 shows the research methodology used in this project.

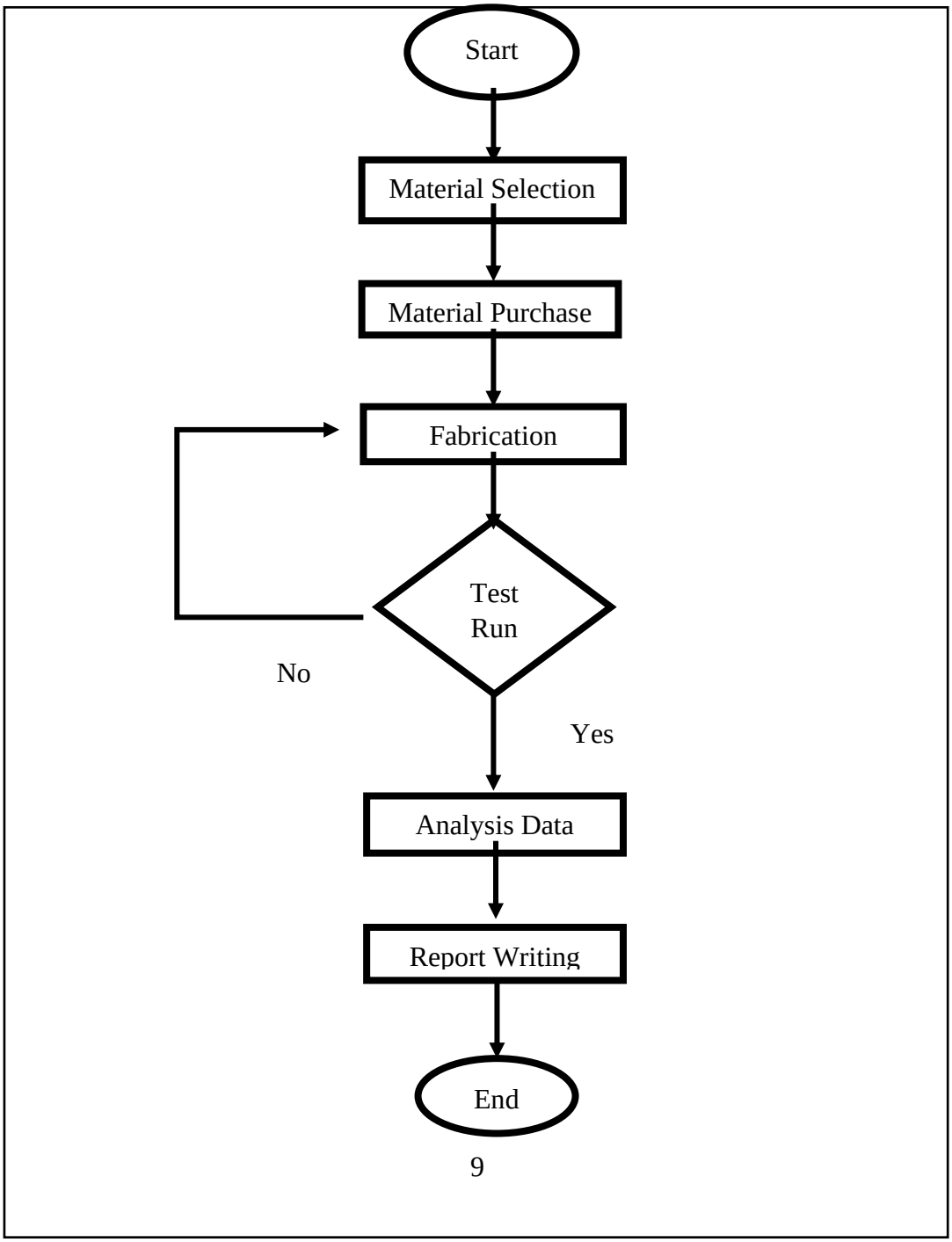


Figure 3.1

- Concept Selection

The first stage in this methodology is concept selection. All of the group members are required to innovate something to be better and more useful for the future. The title and project of group choice was LAWN TECH. Once the title has been chosen, discussions with the supervisor are held to plan all project implementations so that everything runs smoothly.

- Literature Review

Research is made to find information about the theories and concepts of the project. In addition, make a research of the existing equipment and collect the ideas from all the information collected. Research has been taken from the internet through various websites regarding lawnmowers and previous studies on lawnmowers.

- Material Purchase

Research on the durability and suitability of the material was conducted. Then the material selection was chosen. For example lawn mower, lawn mower blades, tires and iron rods for frames. Not all of these materials are purchased, but some are personal stuff.

- Fabrication

In this process, each material that has been obtained will be assembled according to appropriate methods such as cutting, welding and assembly.

- Test Run

After completing the machine, the machine will be tested for its effectiveness. For example, the machine can be turned on, the ability to move smoothly, the cutting process runs smoothly and the time taken to mow the grass in the selected area.

3.2 Product design

The layout is conceptualized as a wheeled lawn device that can compose the peak of the handle in line with the comfort of the user. The device may be moved without difficulty to the left or to the proper due to the fact it's far geared up with three long-lasting tires. the peak of this device is 49cm and width 25cm. Also, this device makes use of petroleum oil and 2T oil to electricity the engine.

3.2.2 Design

The design has the concept of a bicycle handle, which is a smaller handle and not the same width as the width of the tire. Users will have limited handle space compared to concept one. This design is also less supportive of machine movement due to less width.

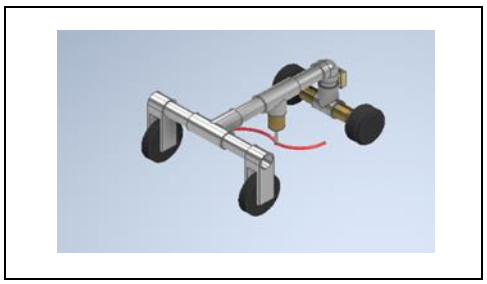


Figure 3.2 Design

3.2.4 Material Selection

The machine makes use of metal because of the fundamental body. metal became selected due to long-lasting. Also, metal body is likewise a number of the long-lasting substances for heavy paintings including lawn mowers. Steel has a variety of properties, which include hardness, toughness, tensile strength, yield power, elongation, fatigue strength, corrosion, plasticity, malleability and creep. Properties like Tensile strength in moderate metal has been selected for this project In addition, a deflector plate used of a plastic cloth that could save you stone splashes. These cloth is the most inexpensive and appropriate for the shield. Figure 3. four indicates a kind of moderate metal.

Figure 3.3 mild steel

3.3 Analysis

The time taken to mow the lawn on an area of 1076 m2. Comparisons will be carried out to distinguish the time taken by a typical lawn machine. The results of the research will be given positive results about the project produced which is more time saving by using this project machine**.**

3.4 Prototype

The first concept design was chosen because the wide handle design is ideal for use. In addition, this design also supports the weight of the machine because of its width.

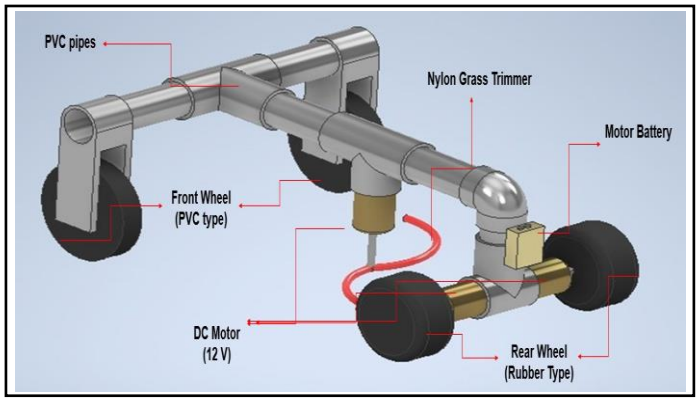
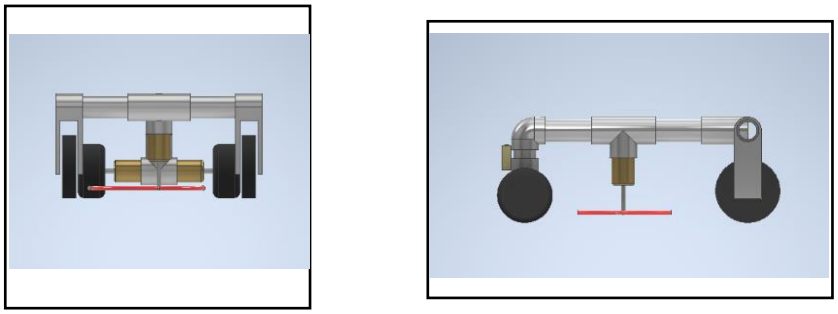


Figure 3.4 Isometric view



(a) (b)

Figure 3.5 Final design (a) front view and (b) side view

CHAPTER 4

PRELIMINARY FINDINGS OF THE RESEARCH

4.1 Introduction

The result of the project is to produce a machine that is acceptable to users and the community. The project is intended for lawn mowing jobs in home yards and open fields. In addition, the project also aims to reduce the problem of injuries to users such as part of the human body during or after lawn mowing activities.

4.2 Preliminary investigation

A preliminary investigation of the study was conducted in order to gather information or opinion from the surrounding community on problems when mowing the lawn.

Figure 4.2.1 Question 1

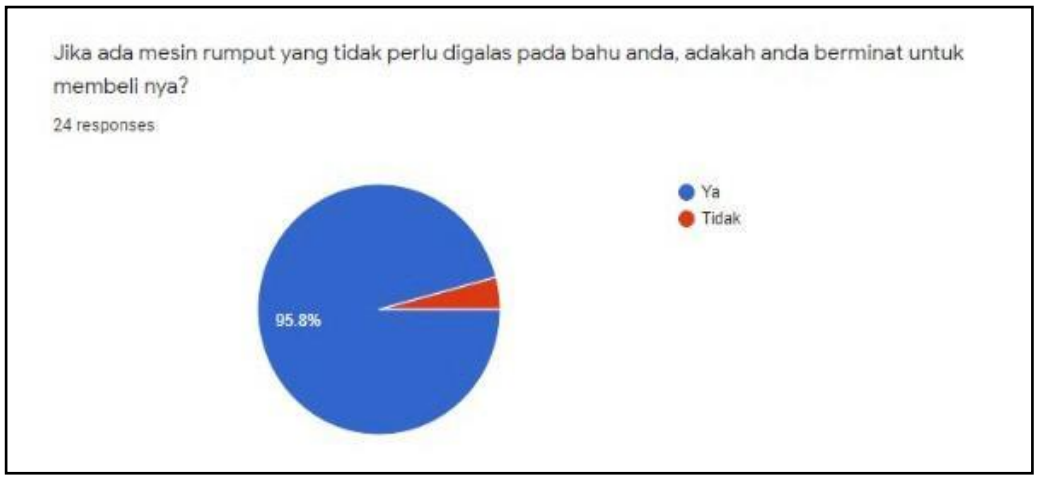


Figure 4.2.1 Question 2

Figure 4.2.3 Question 3

4.3 Recommendation

The suggestion to the users is this project has been evaluated and will facilitate the activities of mowing the lawn due to its improved design. This concept that facilitates movement is particularly useful for long lawn mowing periods as it does not invite injury and is more time-saving.

4.4 Conclusion

The results of the survey that have been conducted can conclude that many lawn machine users out there are affected due to carrying a heavy lawn machine. Moreover, many are interested in this project due to its design factors. Then, many are interested in buying this machine if it is sold in the market. In conclusion, this project has attracted interest and the community showed a positive response to this project.

CHAPTER 5: CONCLUSION AND RECOMMENDATION

5.1) Introduction

For this chapter, the decision is made based on all the results obtained from the experiments conducted and the discussion is about the objectives of the study and also recommendations for the study conducted. In addition, conclusions have been drawn for this experiment.

5.2) Conclusion

The main objective of the Lawn-Tech is to facilitate the work to design the ergonomically friendly lawn mower and minimize the cutting time, as well as requires less manpower. The team managed to design the project and was able to assemble the project. In spite of that, we can manage to apply the skills of engineering while making this project that has learned throughout the course.

5.3) Recommendation

To more experience the benefits of utilising this equipment, the following suggestions are made to make this lawn tech to be more effective and useable. First, the Lawn tech battery needs to be fully charged to get a much longer time in grass cutting. Second, the current nylon grass trimmer can be modified and changed to a blade for more fast grass can be cut. Finally, the type of battery usage can be improved since the battery runs out quickly.

5.4) Project Limitation

- The battery of this remote control needs to be charged.
- Last for a certain time depending on the area of the cutting grass.
- Cannot be exposed to water.

5.5) Summary

This chapter is about the project improvements that need to be done to make this project work effectively as there are many advantages that this Lawn Tech have.

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APPENDICES

APPENDIX A Gantt Chart

APPENDIX B Task schedule

APPENDIX C Final Product Design

APPENDIX D Cost and expenses

APPENDIX E Originality MYIPO

APPENDIX A

TIMEFRAME FOR FINAL YEAR PROJECT 1 (GANTT CHART)

Week/activities project	status	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
Selection of group members	P														
	C														
Project title selection	P														
	C														
Component survey	P														
	C														
component selection	P														
	C														
design project	P														
	C														
fabrication process	P														
	C														
writing report	P														
	C														
preparing slide for the presentation	P														
	C														
final project presentation	P														
	C														

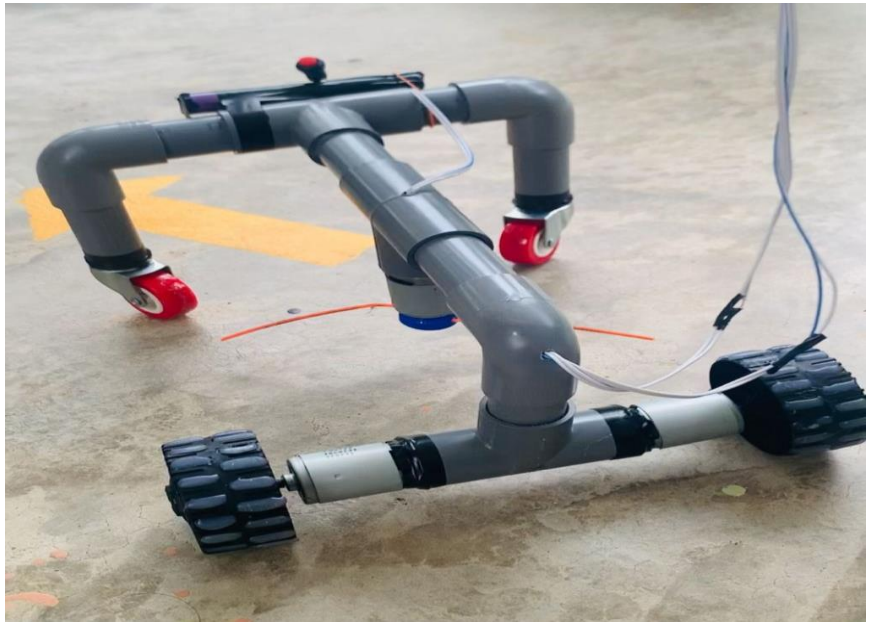
APPENDIX B

TASK SCHEDULE

NO	NAME	TASK
1	MOHAMAD ALIF HAIKAL BIN ABD HALIM	• Proposal • Material selection • Material purchase
2	MUHAMAD SYAHROZIKRY BIN MOHD SAMSOL SHAH	• Gantt chart • Inventor sketching • Budget & marketing
3	NORHAFIZ BIN SHAHARI	• Design • Preliminary result • Poster, Project video

APPENDIX C

Final Product Design



APPENDIX D

Table 1 List of Materials and Approximate Expenses

	ITEM	QUANTITY	AMOUNT (RM)
1	Battery holder	2	20.00
2	Rubber type wheel	2	5.00
3	PVC type wheel	2	3.00
4	Wire	3	10.00
5	PVC pipe	2	15.00
6	Switch	2	10.00
7	Dc Motor	3	51.00
8	Battery	6	2.77
9	Battery Charger	1	7.00

TOTAL	**RM118.00**
SELLING PRICE	RM150

APPENDIX E

Originality MYIPO

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Name : DR WAN ROSEMEHAH BINTI WAN OMAR
I.C / Passport No. : 740506-03-6080
Address : RESEARCH AND INNOVATION UNIT,
: POLITEKNIK SULTAN SALAHUDDIN ABDUL AZIZ SHAH
: PERSIARAN USAHAWAN, SEKSYEN U1
Postcode : 40150 City : SHAH ALAM Nationality : MALAYSIAN
State : SELANGOR Country : MALAYSIA
Telephone No. : 01137035710 E-Mail : rosemehah@psa.edu.my Fax No. :

Signature,

(Dr. HJH WAN ROSEMEHAH BINTI WAN OMAR
Name Ketua Pusat Penyelidikan dan Inovasi
Date (dd/mm/yy) Politeknik Sultan Salahuddin Abdul Aziz Shah
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