MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE (UGC-AUTONOMOUS)
Affiliated to JNTUA, Ananthapuramu & Approved by AICTE, New Delhi
Recognised Research Center, Accredited by NBA for CSE, ECE, EEE, ME & MBA
World Bank funded Institute, Recognised by UGC under the sections 2(f) and 12(B) of the UGC act 1956
Recognised as Scientific & Industrial Research Organization by DSIR of DST

DEPARTMENT OF MECHANICAL ENGINEERING

List of Office Bearers (2020-21)

SAE INDIA COLLEGIATE CLUB OF MITS (SOUTHERN SECTION)

Principal	Dr. Yuvaraj. C
SAE Coordinator	Dr. Suryanarayana Raju
Faculty Advisor	Dr. Chakradhar. B
Student Secretary	Mahesh Naik
Student President	K S Jayanth Kumar
Student Vice President	Hemanth Kumar
Student Chairperson	Syed Moinuddin
Student Treasurer	Jalugu Siva Narayana Reddy

PRINCIPAL
Madanapalle Institute of Technology & Science
PO Box NO 14, Kadiri Road, Angallu
MADANAPALLE 517 325 A P

SAEINDIA
SOUTHERN SECTION

MITS SPARKERS

ELECTRIC TWO WHEELER DESIGN COMPETITION (ETWDC) 2020

(DESIGN REVIEW-1)

By Team

"MITS SPARKERS"

From

MADANAPALLE INSTITUTE OF TECHNOLOGY & SCIENCE

TEAM DETAILS

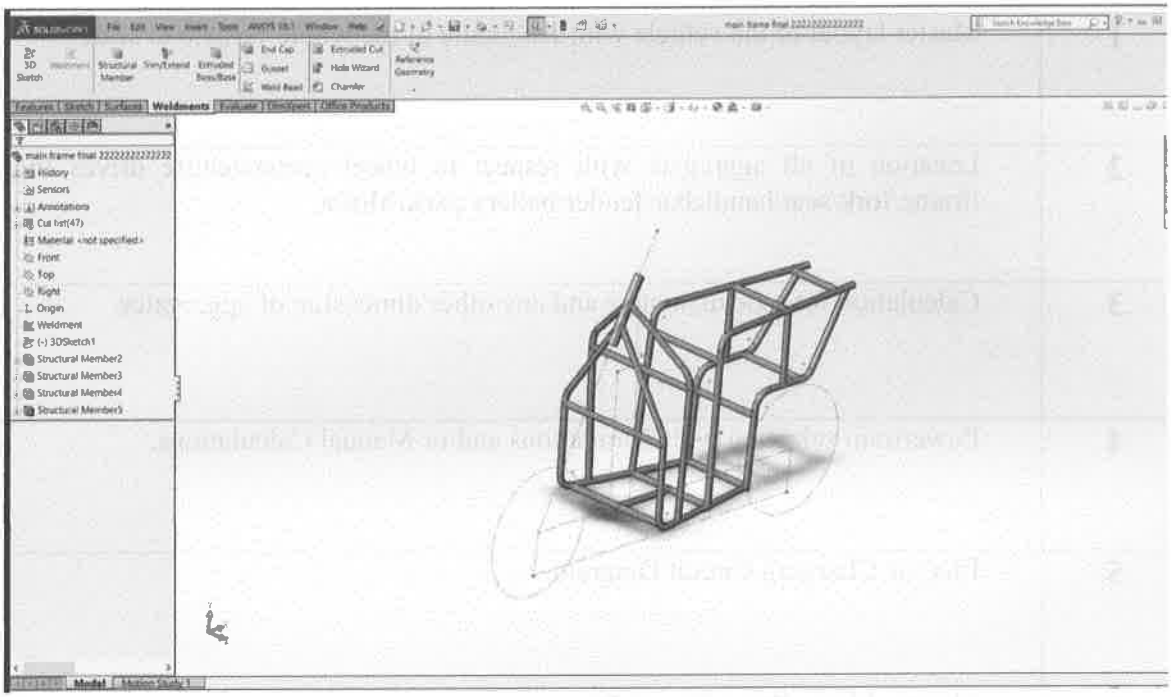
TEAM NAME : MITS SPARKERS
TEAM ID : ETWDC20200154
TEAM MAIL : mitssparkersebike@gmail.com
ADVISER NAME : Mr.Purjari Rajesh (Asst.Professor)

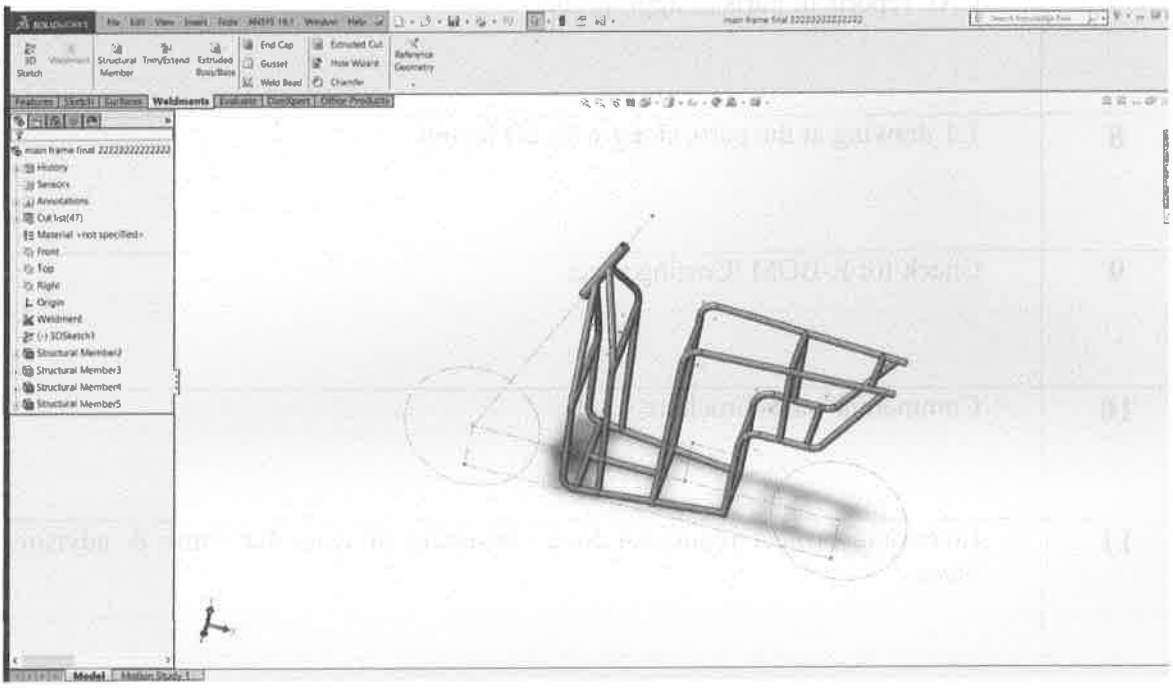
S.No.	Name	Membership ID	Mail ID	Contact No.
1.	Mohammed Rafiq	7190430131	mohammedrafiq@gmail.com	9505519132
2.	Mohanth Palem	7190430113	mohanth.palem.1999@gmail.com	8328505850
3.	K Kirankumar	7190430133	viratkiran9553@gmail.com	7288992265
4.	Syed Moinuddin	7190429733	syedmoin007@gmail.com	6305397274
5.	Shaik Khalid Mateen	7190430134	shaikmateen110@gmail.com	9550056984
6.	Afreed Shaik	7190430600	shaikafreed301@gmail.com	8328182861
7.	Mahesh Krishna	7190430214	maheshpallipaga@gmail.com	9133620632
8.	S Noor Mahammad	7190430132	noorshaik000786@gmail.com	7075197572
9.	Chamanchi Rukmini	7190430129	rukminichamanchi@gmail.com	9381238279
10.	N Sumanjali	7190430130	sumanjali117@gmail.com	9502737959

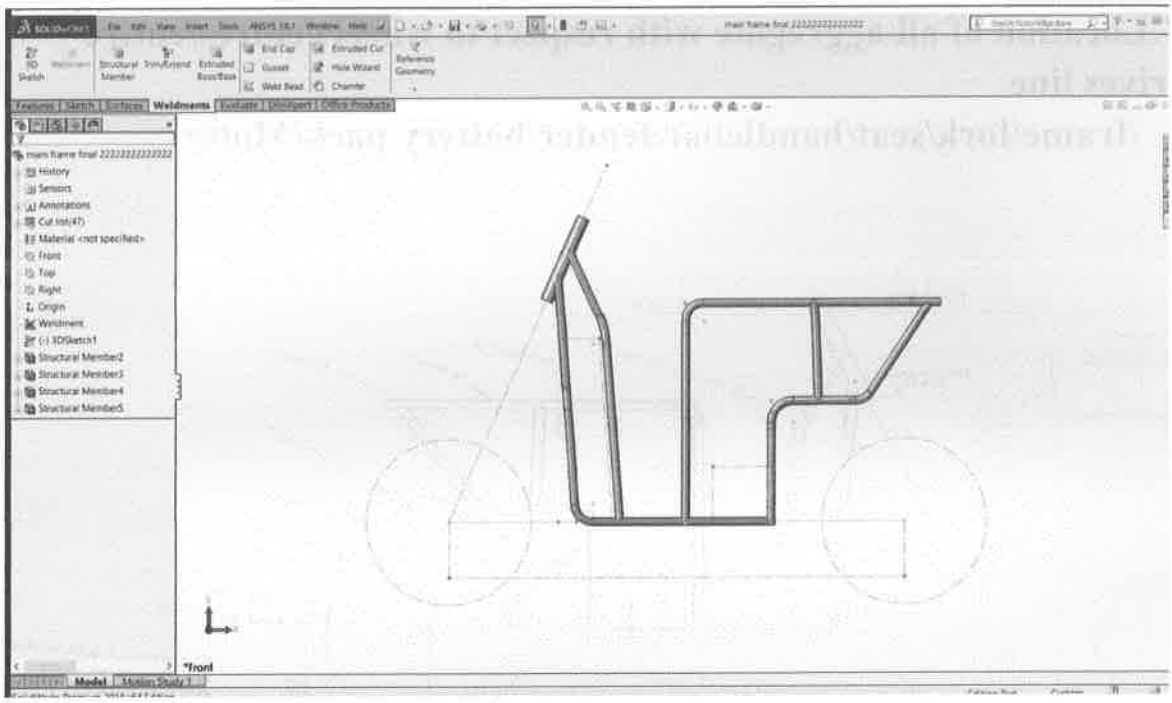
TABLE OF CONTENTS

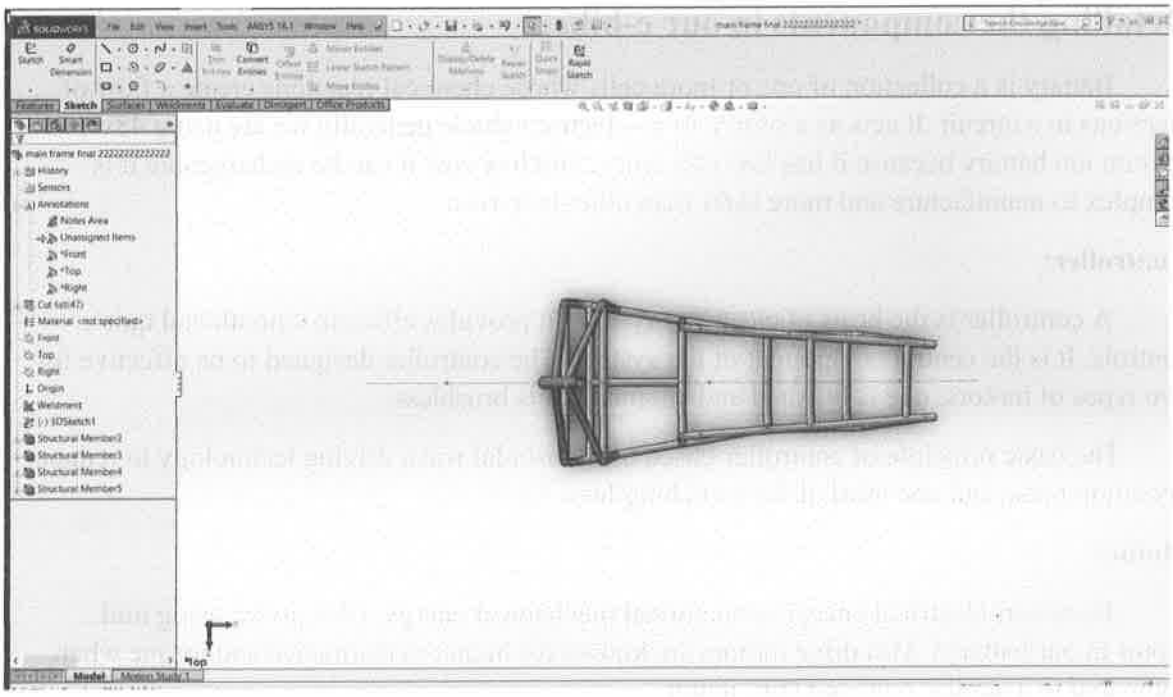
1. Master layout of the vehicle with schematic of the whole vehicle to scale.

The design of the vehicle has been done as per the specified dimensions using **SOLID WORKS** software. The analysis has been done using **ANSYS** software (**WORK BENCH**).

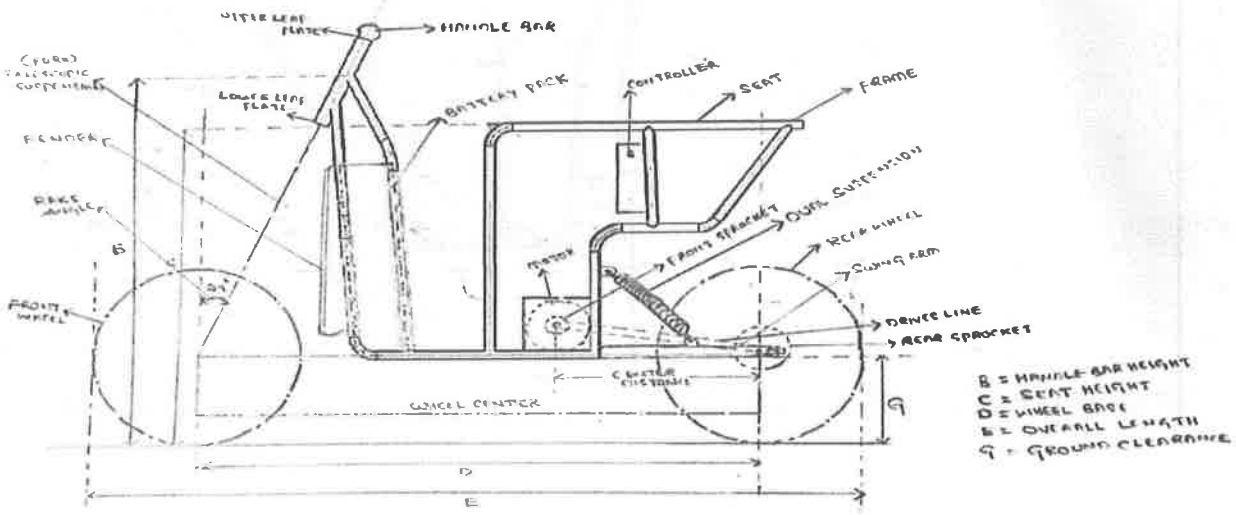





Weldments
main frame final 2222222222222
History
Sensors
Annotations
Cut-list(47)
Material <not specified>
Front
Top
Right
Origin
Weldment
(-) 3DSketch1
Structural Member2
Structural Member3
Structural Member4
Structural Member5
*Front
Model
Motion Study 1


Sketch
Smart Dimension
Features
Sketch
Surfaces
Weldments
Evaluate
DimXpert
Office Products
main frame final 2222222222222
History
Sensors
Annotations
Notes Area
Unassigned Items
*Front
*Top
*Right
Cut-list(47)
Material <not specified>
Front
Top
Right
Origin
Weldment
(-) 3DSketch1
Structural Member2
Structural Member3
Structural Member4
Structural Member5
*Top
Model
Motion Study 1

2 .Location of all aggregate with respect to wheel centres/entire drives line /frame/fork/seat/handlebar/fender/battery pack/Motor.



Detailing the components in our e-bike:

Battery is a collection of one or more cells whose chemical reactions create a flow of electrons in a circuit .It acts as a source of an electric vehicle generally we are using 48v lithium ion battery because it has low efficiency, and low cost it can be rechargeable it is complex to manufacture and more safer than other batteries.

Controller:

A controller is the heart of electrical system. It provides efficient smooth and quit controls. It is the central component of the system. The controller designed to be effective for two types of motors, one is brushed and another one is brushless.

The basic principle of controller based on sinusoidal wave driving technology to reduce operation noise and one third of the switching loss.

Motor:

It convert electrical energy to rotational mechanical energy. (We prefer using mid motor in our battery). Mid drive motors are known for higher performance and torque when compared to a similar powered hum motor.

Suspension:

Suspension is the system of springs, shock absorbers and linkages that connect a vehicle to its wheels in order to insulate them from uneven roads

Serve a dual purpose for handling and provides smooth riding and also it keep firm contact with road and also it support weight

It isolate passenger from vibrations and shocks due to irregularities of the road surface. The main function is to preserve the stability of the vehicle in pitching or rolling.

Brakes:

Breaks is a mechanical device which inhibits the motion by absorbing energy from moving system. Breaks are used to slow or stop the motion of vehicle. The main function of breaks are absorption and deceleration the disc break is preferred to front wheel and drum brake is preferred to rare wheel disc brakes follows the principle of pascals law disc brakes works on compression process in disc brakes the brake pads compress the disc to stop the vehicle in disc brakes departments of transportation (DOT) fluids is used to transfer the pressure the drum brakes works on expansion process in drum brakes the brake shoes expand to control the speed of vehicle.

Steering:

Steering is the collection of linkages and components etc., which allows any vehicle any vehicle to follow its desired course. The function of steering is to convert rotatory movement of wheel into angular turn of wheel. Steering system is designed to enable the driver to control and continuously address the steered part of the vehicle.

Fabrication:

Converting pieces of material into usable shapes, generally though machining cutting, welding, assembling, is followed to create machine parts that form as raw material from structure

Material used:

By choosing of AISI1018 for this frame excellent weldability produces a uniform and harder case and it is considered the best steel for carburized parts.

3. Calculation for tube diameters and any other dimension of aggregates.

Material used: AISI1018:

Specification: 25.4mm *2mm

Cost (per meter): 250/-

Shape: Round: Round

Material type: Ductility Material

MECHANICAL PROPERTIES:

Poission Ratio (γ)= 0.29	Carbon(c)-0.18%
Modulus of elasticity (E) = 205 Gpa	Iron (Fe) - 98.81%-99.26%
Bulk Modulus (k) = 140 Gpa	Manganese (Mn)-0.6-0.9%
Yield Strength = 370 Mpa	Phosphorus (p) - ≤0.04%
Tensile Strength = 440 Mpa	Sulphur(s) - ≤0.05%
Density = 7.8 g/cc @7800 kg/cm	
Reduction in Area = 40%	
Shear Modulus (G) = 80	
Gap Hardness = 126	

CHEMICAL COMPOSITION:

Carbon(c)-0.18%

Iron (Fe) - 98.81%-99.26%

Manganese (Mn)-0.6-0.9%

Phosphorus (p) - ≤0.04%

Sulphur(s) - ≤0.05%

The applied force on frame it experience some pressure on it due to that the physical properties are also changes

FOR THE AISI 1018(ULTIMATE TENSILE STRENGTH):

» STRESS:

$$\sigma = \frac{N}{A}$$

$$\sigma = \frac{20\ KN}{\frac{\pi}{4}\times(25.4mm)^2}$$

$$\sigma = 0.0394\frac{KN}{mm^2}$$

» By passing ratio The Longitudinal strain

$$\gamma = E.\epsilon$$

$$\epsilon_{long} = \frac{\sigma}{E} = \frac{0.0394Gpa}{440\ mpa}\ 0.089\text{mm/mm}$$

» *Lateral strain*: $-(\gamma = 0.3)$

$$\gamma = \frac{\varepsilon_{lat}}{\varepsilon_{long}}$$

$$\varepsilon_{lat} = -\gamma\varepsilon_{long}$$

$$\varepsilon_{lat} = -(0.3)\times 0.89\frac{mm}{mm} = -0.026$$

» *change in diameter*:

$$\varepsilon_{lat} = \frac{\Delta D}{D_0}$$

$$\Delta D = -0.026\times 25.4mm$$

$$\Delta D = -0.66mm$$

Final Diameter:

$$\Delta D = D_f - D_0$$

$$D_f = -0.66 + 25.4$$

$$D_f = 24.740mm$$

» *To caluclate Yield Strength*: –

$$\sigma = \frac{N}{A} = 0.0394\ Gpa$$

» *Longitudinal strain*:

$$\varepsilon_{long} = \frac{\sigma}{\varepsilon}$$

$$\varepsilon_{long} = \frac{0.0394\ Gpa}{370\ mPa} = 0.106mm/mm$$

» *lateral strain*:

$$\varepsilon_{lat} = -\gamma\varepsilon_{long}$$

$$\varepsilon_{lat} = -0.0318mm$$

» *change in diameter*:

$$\Delta D = -0.807mm$$

» *final diameter*:

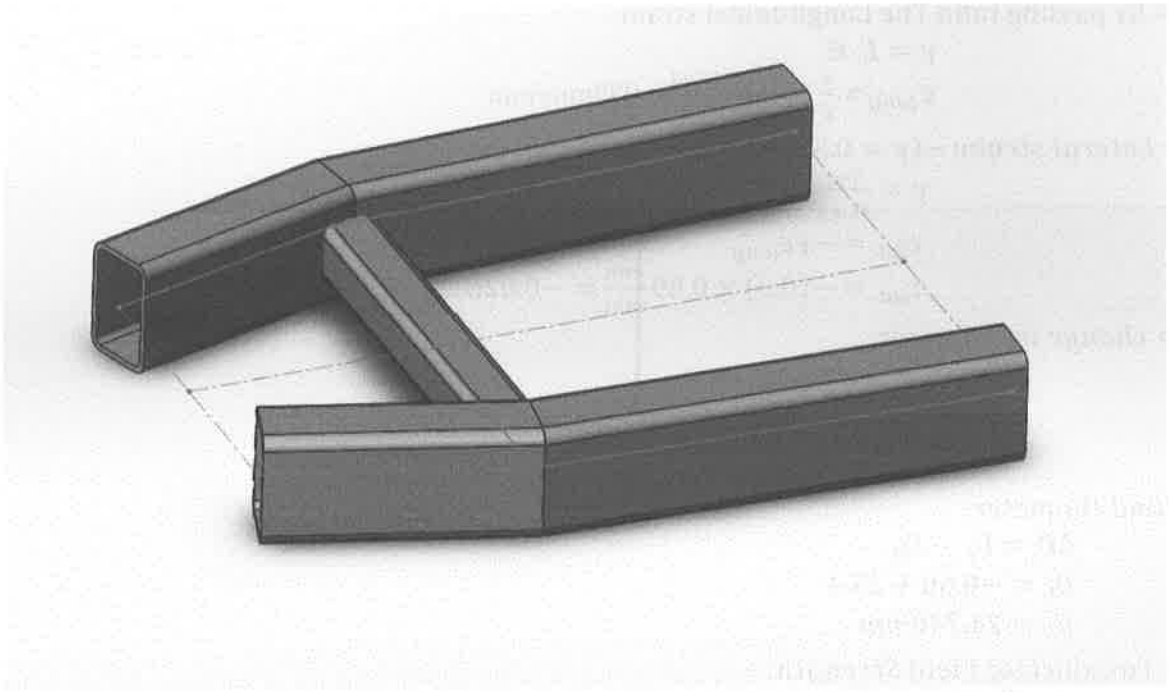
$$D_f = 24.593mm$$

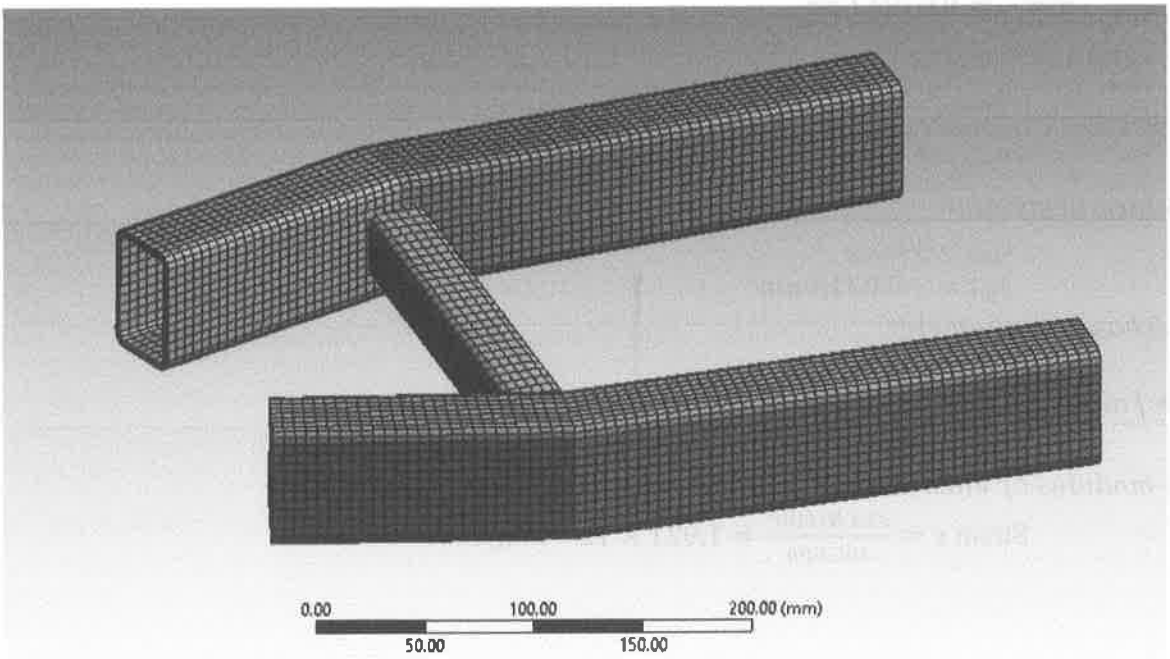
» *modulus of elasticity*(205Gpa):

$$\text{Strain } \varepsilon = \frac{39.4\ N/mm^2}{205\ Gpa} = 1.921\times 10^{-4}mm/mm$$

4. Powertrain simulation and manual calculations:

SWINGARM AND SIMULATION:





Tractive effort is the force available at the point of contact between the rear wheel tyres an the roads.it is mainly required to overcome the forces opposing motion of the vehicle the ability of the rear wheels to transmit the tractive effort without slipping is known as TRACTION. The following resistances are encountered by the vehicle:

1. Rolling resistance

2. Gradient resistance

3. Air or wind resistance

1. Rolling Resistance: - IT is the force necessary to maintain constant speed on a road.it is generally varies with the types of the roads (loose, sandy, tar roads).

Rolling resistance R_r =KW

Where K=constant depends upon the nature of the Roads

For best roads K=0.0095,

For loose sandy Roads K=0.18

W=Total weight with rider in Kg.

We have K=0.18

W=180Kg

Rolling resistance (R_r) =KW

=0.18×180=32.4

2. Gradient Resistance: - It is the force opposing forward motion of the vehicle up a gradient .the resistance does not depends on speed of the vehicle.

Gradient resistance (Rg) =WsinØ

Where W=Total weight in Kg

Φ =Angle of inclination

We have W=180Kg

$\Phi=45^0$

Then R_g=WsinΦ=180×sin45^0=180×1/v2=127.27

3. Air (or) wind Resistance: It is the force opposing or supporting the motion of the vehicle when the wind direction is opposite in direction of the vehicle, the wind resistance opposes the motion of the vehicle. This resistance depend on the speed of the vehicle, wind velocity, size and shape of the body of the vehicle.

In Air (0r) wind Resistance $R_a=K_aAV^2$

Where, ka=co-efficient air resistance

=0.00235for best streamlined cars

=0.0032 for averaged streamlined cars

=0.0046 for trucks and Lorries

=0.00183 for two wheelers

V=max.speed of vehicle kmph

A=area of vehicle in m^2

Let,

Ka=0.00183

V=35 kmph

A=1.35

Then $Ra=KaAV^2=0.00183\times1.35\times35\times35=3.026$

Total tractive effort:

TTE=Rr+Ra+Rg

=32.4+127.27+3.026

=162.69

The torque produced in wheel is known as Torque on the wheel.

It is defined as,

Tw=TTE × Tyre radius× Resistive friction (1.12)

From tyre dimensions,

Radius r=0.152m

Resistive friction Rf=1.12(constant)

Then torque on wheel (Tw)=TTE× Tr ×Rf

=162.9×0.152×1.12

(Tw)=27.69 N-M

To calculate the sprocket ratio,

Initial torque in motor (Tmi) =8 N-M

Final Torque in motor (Tmf) =24 N-M

Sprocket ratio is calculated as:

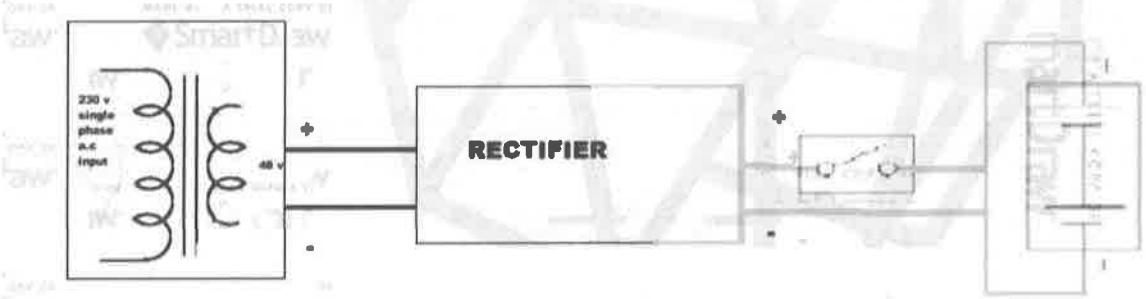
Torque on wheel: Initial torque in motor (N-M)

= 27.69:8

=3.5:1

5. Electric Charging Circuit Diagram:

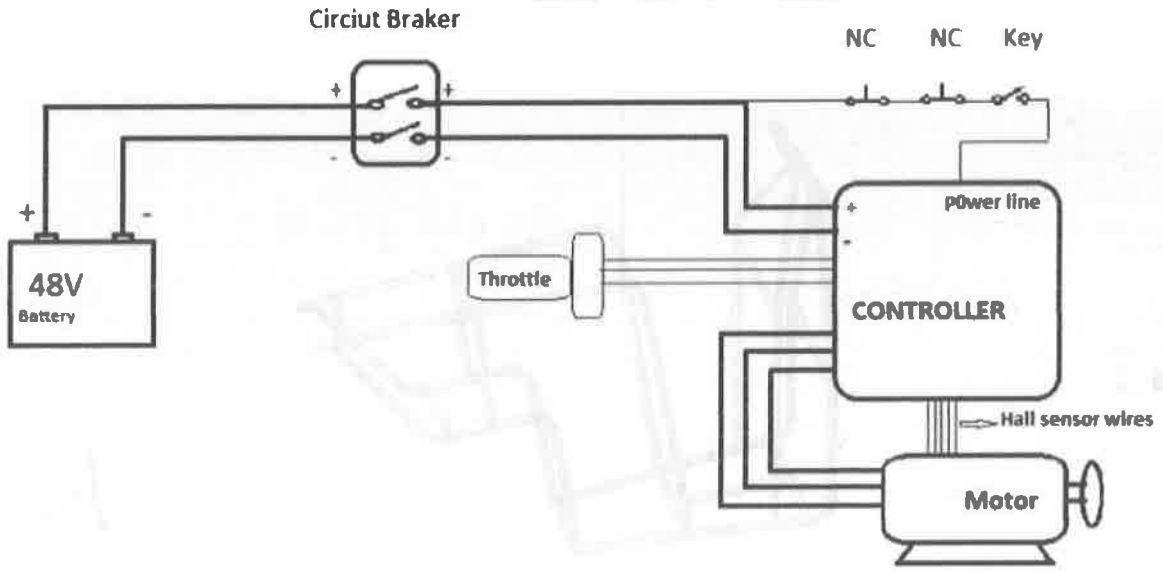
In the transformer AC voltage (230V and 50Hz)is taken as a input the step-down transformer decrease the voltage up to what we need(48V and 50Hz). From the transformer the voltage will go through the rectifier where the AC convert to DC current. From the rectifier the current will pass through where the electric static energy is stored. From there the male to female connector we connect the switch to close or open the electric charging circuit



ELECTRIC CHARGING CIRCUIT DIAGRAM

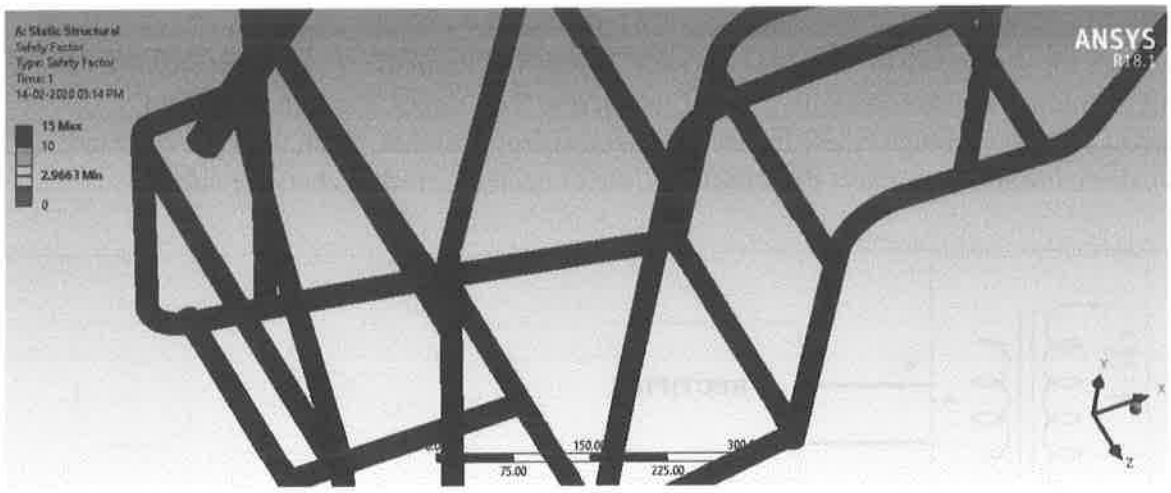
6. Electric Motor Drive Circuit Diagram:

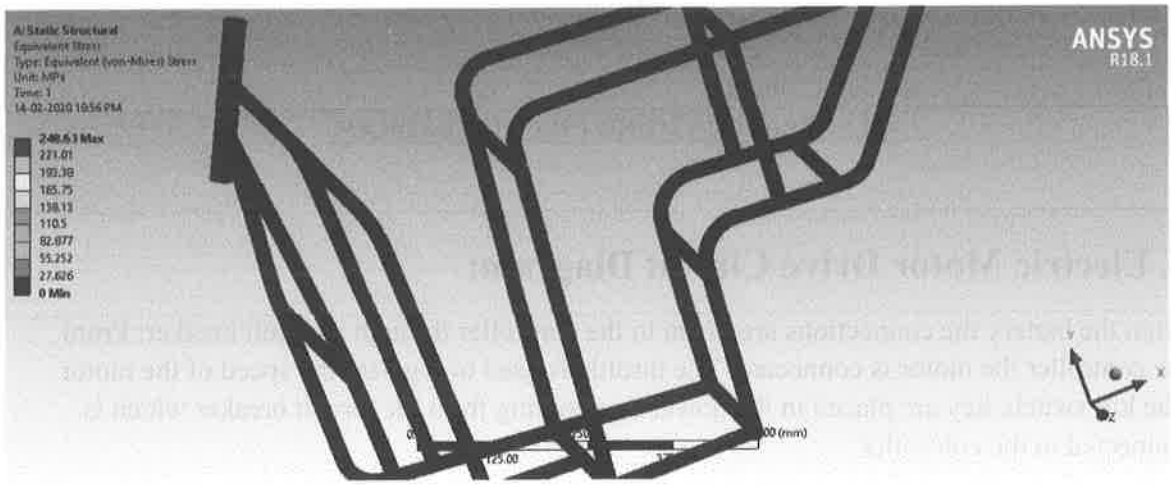
From the battery the connections are given to the controller through a circuit breaker. From the controller the motor is connected. The throttle is used to regulate the speed of the motor. The kill switch, key are placed in the power line coming from the circuit breaker which is connected to the controller.

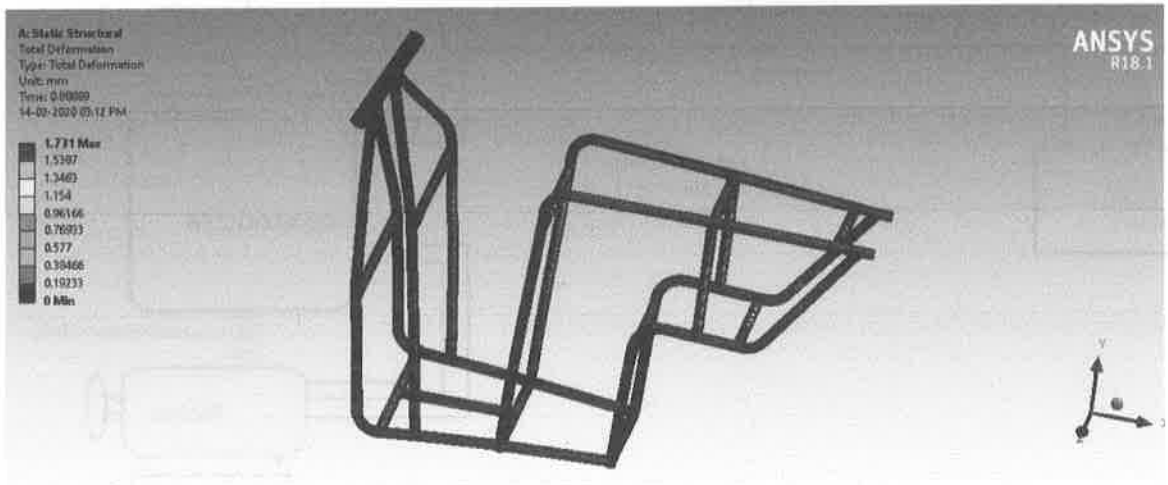


ELECTRIC MOTOR DRIVE CIRCUIT DIAGRAM

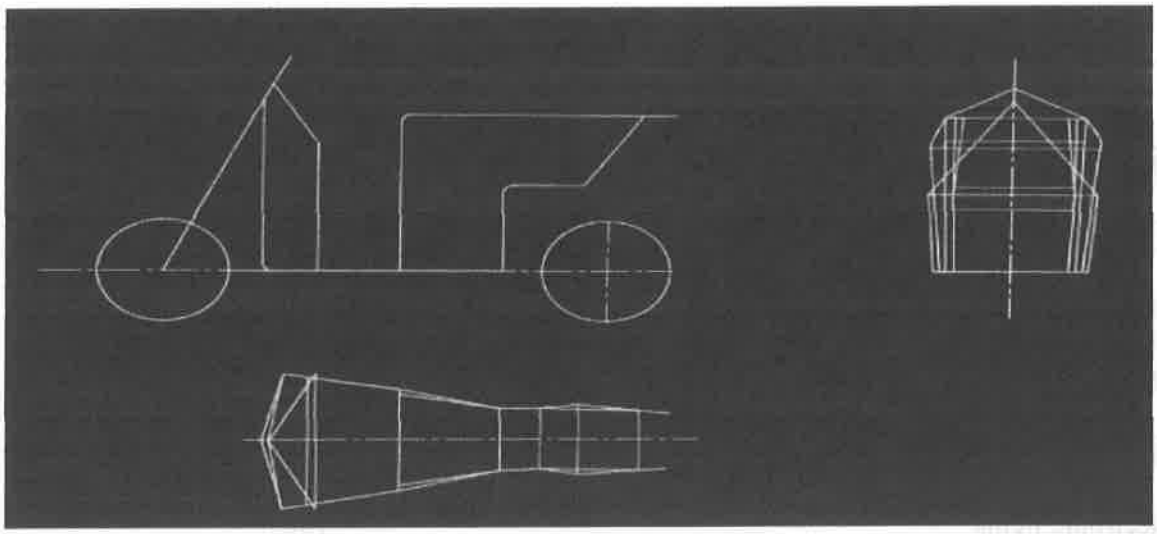
7. CAE reports of parts as appropriate:

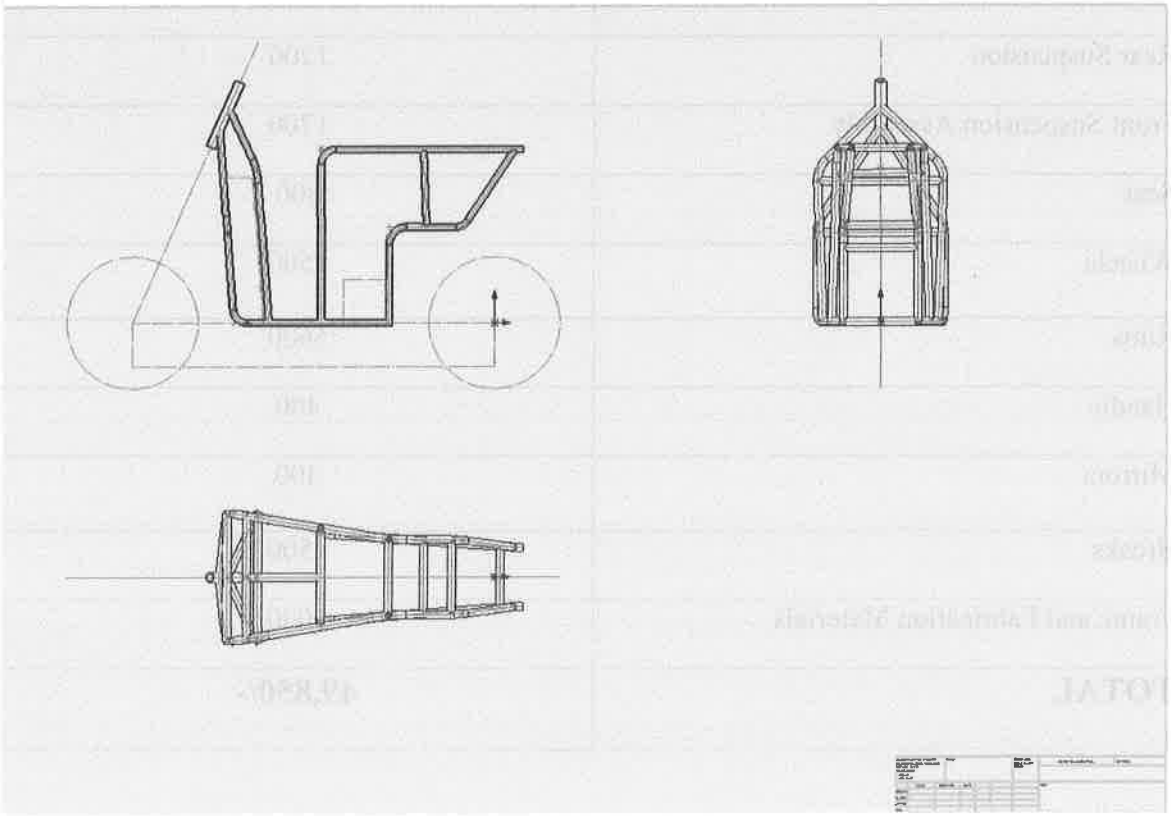






8. 1:1 drawing at the parts along with 2D layout (CAD):





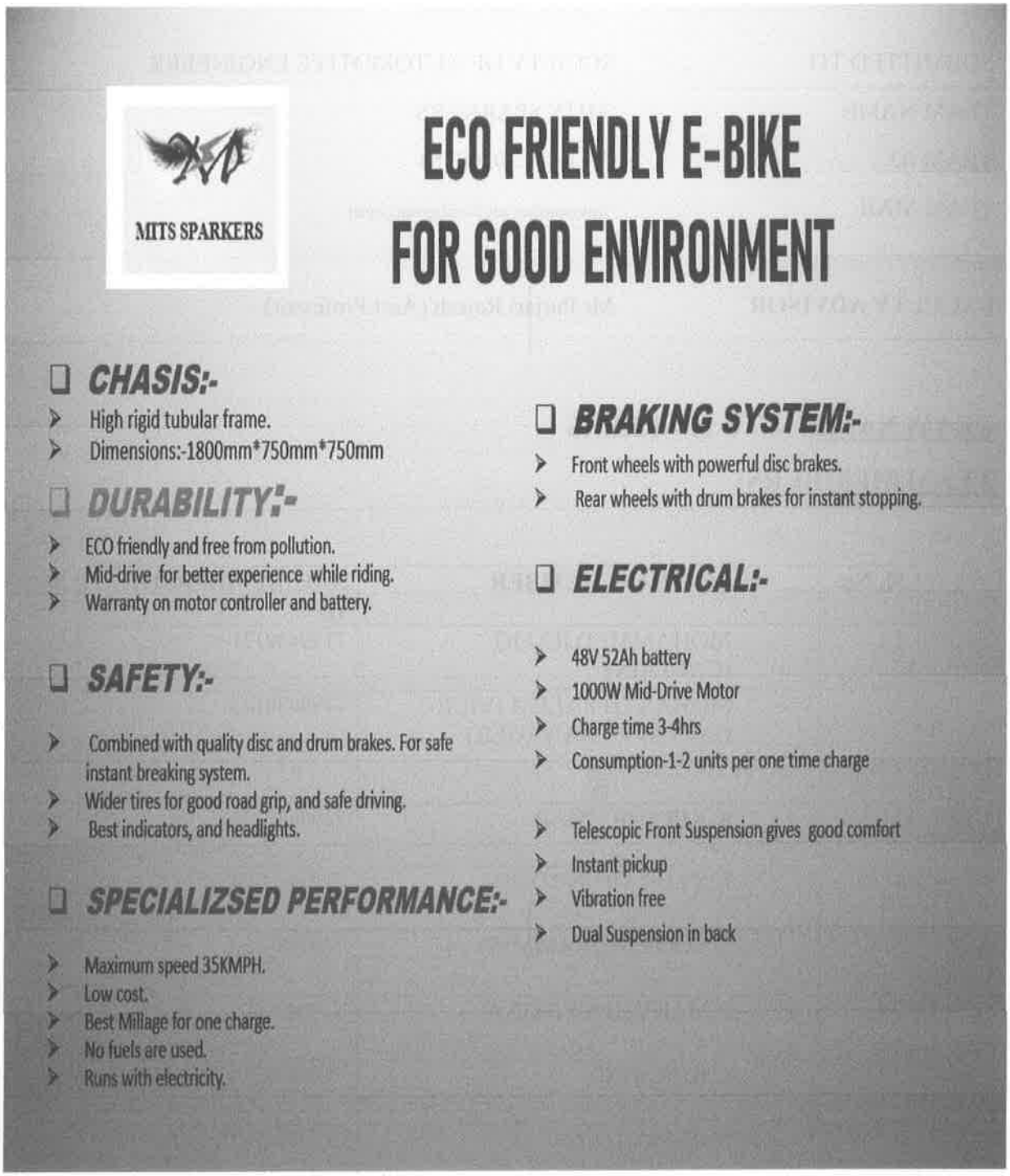
9. E-BOM Costing Sheet:

E-BILL OF MATERIALS (E-BOM):

COMPONENTS	AMOUNT
Motor with controller	8000
Kill Switches	250
Fire Extinguisher	1000
Electrical wiring	1500
Lights	1000
Electronic Items	1000
Battery	16000
Rear Suspension	1200
Front Suspension Assembly	1700
Seat	800
Wheels	1500
Rims	5600
Handle	400
Mirrors	400
Breaks	1500
Frame and Fabrication Materials	8000
TOTAL	**49,850/-**

It is estimated that on the whole it may be cost us around Rs: 49,850/- as shown above the cost of each article.

9. COMMERCIAL SALES BROCHURE



12. ELECTRONIC PROJECT REPORT

SUBMITTED TO	:	SOCIETY OF AUTOMOTIVE ENGINEERS
TEAM NAME	:	MITS SPARKERS
TEAM ID	:	ETWDC20200154
TEAM MAIL	:	mitssparkersebike@gmail.com
FACULTY ADVISOR	:	Mr.Purjari Rajesh (Asst.Professor)

TEAM NAME: MITS SPARKERS

TEAM MEMBERS:

Sl. No.	TEAM MEMBER	SAE MEMBERSHIP ID
1	MOHAMMED RAFIQ (CAPTAIN)	7190430131
2	MOHANTH PALEM (VICE-CAPTAIN / MANAGER)	7190430113
3	K KIRANKUMAR	7190430133
4	K SYED MOINUDDIN	7190429733
5	S NOOR MOHAMMED	7190430134
6	P MAHESH KRISHNA	7190430600
7	C RUKMINI	7190430214
8	N SUMANJALI	7190430132
9	SHAIK KHALID MATEEN	7190430129
10	AFREED SHAIK	7190430130

DEPARMENT OF MECHANICAL ENGINEERING

ACADEMIC YEAR 2020-21								
S. No.	**Date**	**Event Name**	**Event Type**	**Resource Person (if any)**	**No. of Participants**	**Organizer**	**Event Coordinator**	**Place**
1	July 2020 (postponed)	Electric Two Wheeler Design Competition 2020	A national level competition		20	SAEINDIA		Bannari Amman Institute of Technology (BIT), Near Coimbatore, Tamil Nadu

PRINCIPAL
Madanapalle Institute of Technology & Science
PO Box NO 14, Kadiri Road, Angallu
MADANAPALLE 517 325 A P