

GOVERNMENT POLYTECHNIC, BALANGIR



LARKIPALI, BALANGIR

State Council Regd. No. L22110005008

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Roll No. 5008 Semester 6th Session. 2022-24

Branch. AUTOMOBILE Group

Subject. DRIVING PRACTICE & VEHICLE MAINTENANCE

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF AUTOMOBILE



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EXPERIMENT NO: 01

AIM OF THE EXPERIMENT:-

Simple introduction of Automobile engine and their working.

EQUIPMENT:-

- (i) Internal Combustion chamber engine
- (ii) External Combustion chamber engine
- (iii) 4 stroke petrol engine
- (iv) 4 stroke Diesel engine
- (v) 2 stroke Engine.

INTERNAL COMBUSTION ENGINE:-

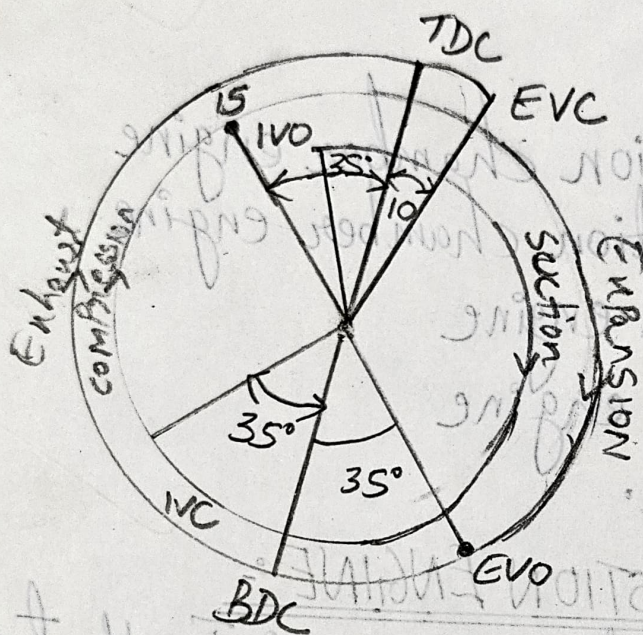
An Internal combustion engine is I.C. Heat engine in which the Combustion of the fuel occurs with an oxidizer in a Combustion chamber that is an integral part of the working fluid flow circuit. In an internal combustion engine the expansion of the High temperature and high pressure gases produced by combustion applies direct force to some component of engine. The force is typically applied to Piston, turbine blade, a Rotor or a nozzle. The force moves the component of engine. The force is

EXPERIMENT NO: 01

AIM OF THE EXPERIMENT:-

to study the working of Automobile engine and

EQUIPMENT:-



IVO - INLET VALVE OPENS
EVO - EXHAUST VALVE OPENS
IS - IGNITION STARTS

IVC - INLET VALVE CLOSURES
EVC - EXHAUST VALVE CLOSURES

TDC - TOP DEAD CENTRE
BDC - BOTTOM DEAD CENTRE



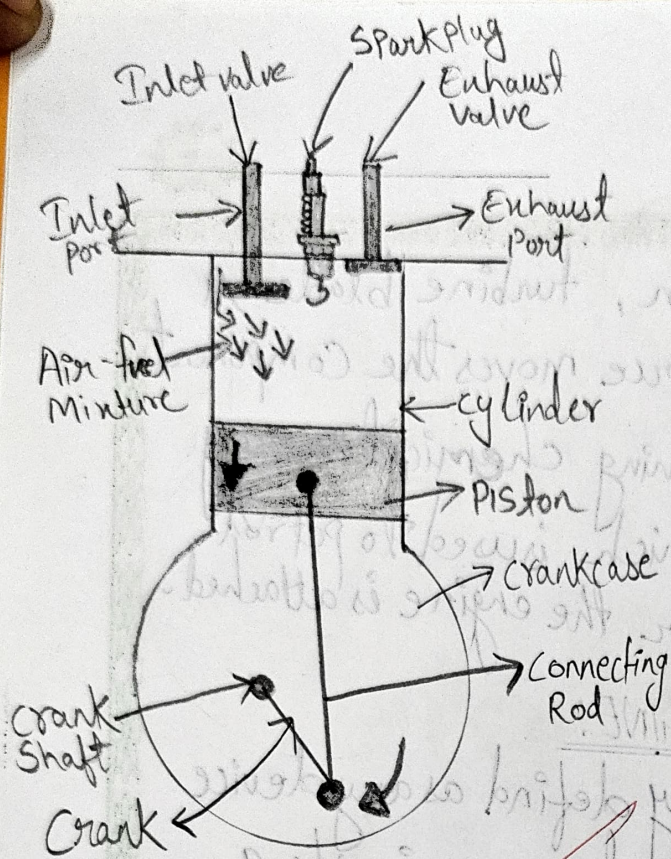
Typically applied to Piston, turbine blade, a Rotor on a Nozzle. The force moves the Component over a distance, transforming chemical energy into kinematic energy, which is used to propel move or power whatever the engine is attached.

② EXTERNAL COMBUSTION ENGINE:

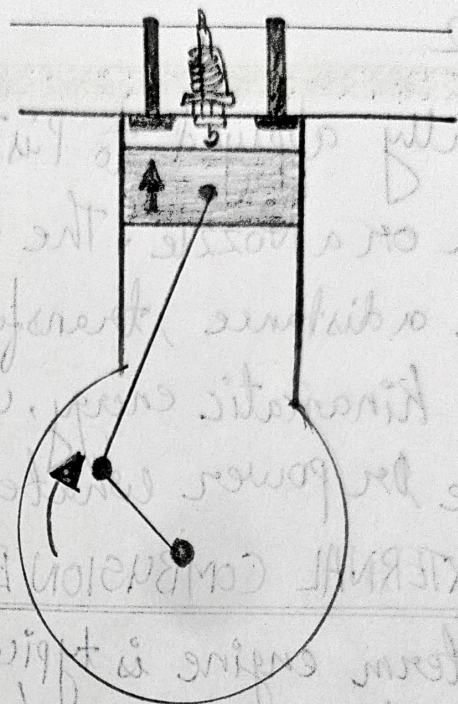
The term engine is typically defined as any device that transforms the chemical energy inside a Combustion fuel into mechanical energy that can be used to work. The external Combustion engine works by using an external heat source (like burning coal) to heat a working fluid (like water). As the temperature of the fluid increased, the fluid expands and this expansion is harnessed and used to do work (like moving a vehicle).

③ FOUR STROKE PETROL ENGINE:-

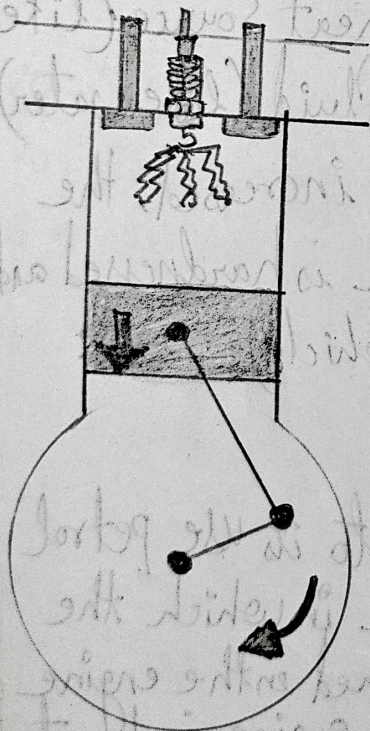
The Otto four stroke cycle refers to its use petrol engine, gas engines, light oil engine in which the mixture of air and fuel are burned in the engine cylinder. Since ignition in these engine is due to a Spark. Therefore they are also called as Spark



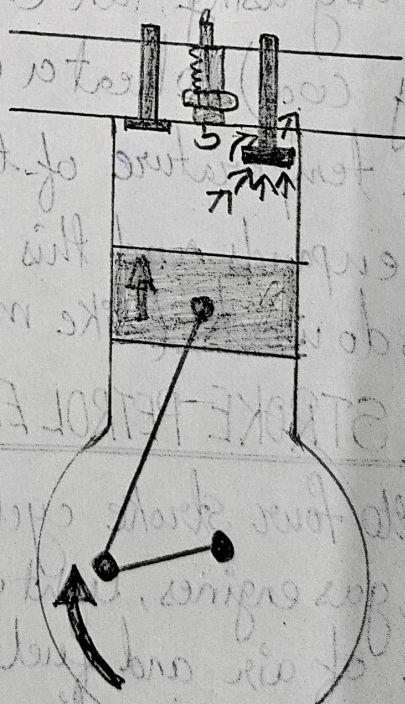
(a) Suction



(b) COMPRESSION



(c) POWER



(d) Exhaust

FOUR-STROKE PETROL ENGINE:-



ignition engine.

SUCTION:-

During the stroke, the piston moves from TDC to BDC. The inlet valve is open and proportional air fuel mixture is sucked in the engine cylinder. The exhaust valve is closed during this stroke.

COMPRESSION:-

In this stroke piston moves BDC to TDC. Both valves are closed. The compressed air fuel mixture inside the engine cylinder during the suction stroke. The pressure of mixture in the cylinder to a value of about 8 bar. Just before the end of this stroke the spark plug creates a spark to ignite the proportionate hot air fuel inside the combustion chamber. Combustion takes place at constant ~~volume~~ ~~volume~~ volume.

EXPANSION / WORKING / POWER STROKE:-

When the air fuel mixture is ignited by the spark plug. The hot gases are produced which drive on through the piston from TDC to BDC and thus the work is obtained in this stroke. It is during this stroke when the get work from the engine, the other three strokes namely Suction, Compression and exhaust being ideal. The flywheel



mounted on the engine shaft it is store the extra energy produce during this stroke, and other Required Power supply of the three ideal stroke.

EXHAUST STROKE :-

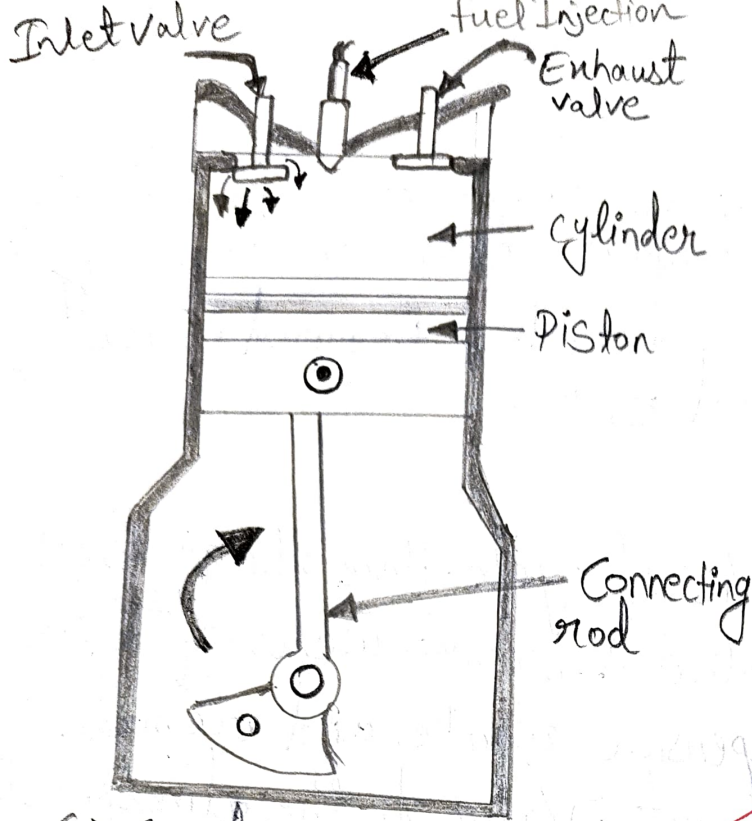
This is the least stroke of cycle. Here the gases which the work has been collected becomes useless after the completion of the expansion stroke and are made to escape through exhaust valve to the atmosphere. This removal of gas is accomplished during this stroke.

FOUR STROKE DIESEL ENGINES :-

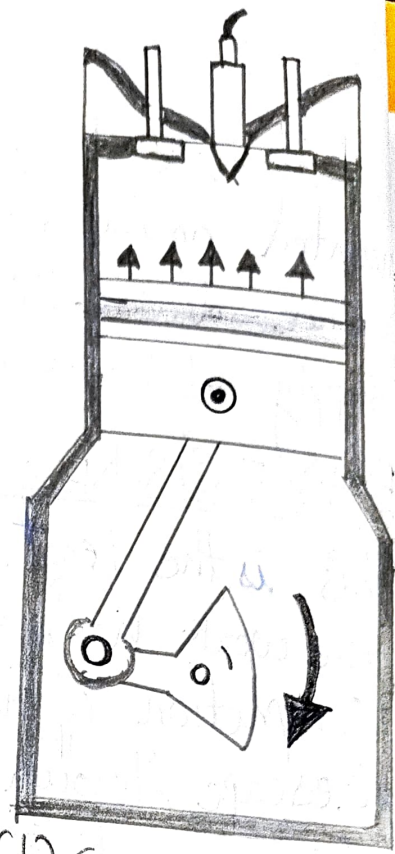
In a Compression ignition engines. the fuel is ignited by the heat of compress air inside the cylinder. There is no spark plug in it to give spark. The air compress in the cylinder during the compression stroke relatively at higher pressure.

SUCTION :-

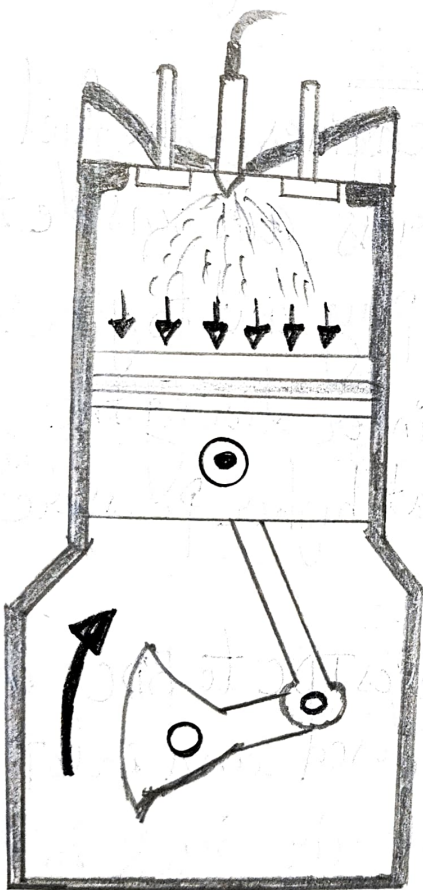
During this stroke piston moves TDC to BDC. in this stroke Exhaust valve is closed and inlet valve is open. The only Fresh air Suck in the engine cylinder.



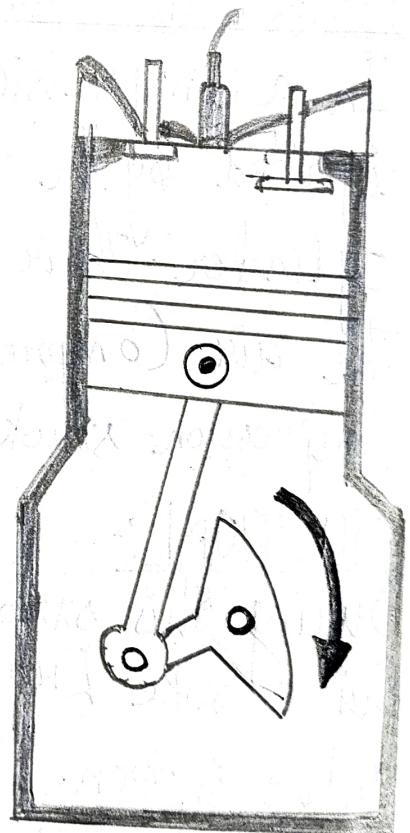
(a) Suction



(b) Compression



(c) Power



(d) Exhaust

Four-Stroke Diesel Engine



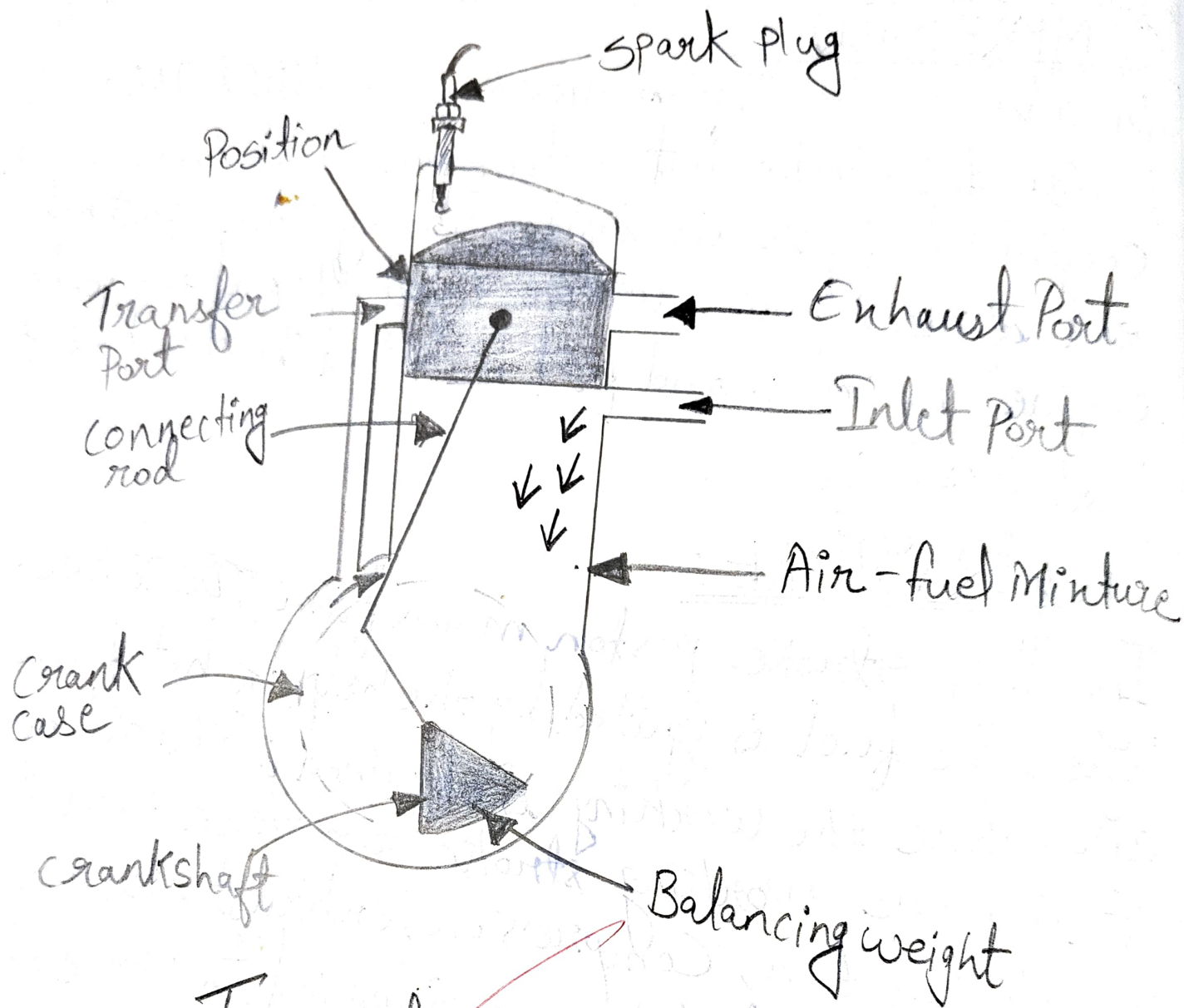
COMPRESSION :-

In this stroke Piston moves from BDC to TDC. During this stroke but valves are closed. The compressed fresh air inside the cylinder. Just before end of the stroke injection inject the fuel inside the engine cylinder and fuel is ignited to the help of heat fresh air.

POWER STROKE :-

In this stroke piston moves from TDC to BDC. When the fuel is ignited by the help of hot fresh air. Those the working is obtained in this stroke. it is a one working stroke and three ideal stroke. Namely Suction, Compression, exhaust. This working stroke developed the power supplied to three ideal stroke and excess power stroke on the flywheel.

In this stroke valve remain closed during the start of this stroke but when the Piston Just reaches the BDC, the exhaust valve is opens.





EXHAUST STROKE:-

It is the last stroke of the cycle. In this stroke, the burnt gases are moved outside by the exhaust valve. The piston moves from BDC to TDC, and the inlet valve is closed and the exhaust valve is opened.

CONCLUSION:-

From this above Experiment we study that types of Automobile engine and their working principle.

Inspected
15/2/24

Submitted by

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Sem- 6th

Date- 8/02/2024



EXPERIMENT NO :- 02

AIM OF THE EXPERIMENT :-

To Study about Vehicle Control

EQUIPMENT REQUIRED :-

- (*) Foot Control's
- (*) Hand Control's
- (*) other Control's

(*) FOOT CONTROL'S

The foot Pedals of a manual vehicle, from right to left, are the acceleration (A), Brake (B), clutch (C), while Vehicle's with automatic transmission have only an acceleration and brake Pedal. When driving, you use the foot Pedals to control your speed and Power.

FOOT BRAKES :-

The foot brake is used to reduce the Car's Speed while driving. The car is equipped with two brake Circuit for safety reasons. If a brake Circuit is damaged then the brake Pedal will engage deeper and a higher pressure on the Pedals.



is needed to produce the normal braking effect.

Acceleration:-

A Accelerator is also known as gas pedal it is the Pedal located on the floor on the far-right. This pedal controls the amount of gas being fed into the engine and there by controls the speed of vehicle you push the accelerator with your right foot with your heel resting on the ground.

Clutch:-

The clutch pedal is used to connect and disconnect the vehicle's engine and transmission. When the clutch pedal is not pressed down, there is a connection between the engine and transmission, and the power of the engine is transmitted to the wheels of vehicle.

Hand Controls:-

Hand controls allow the driver to operate both the brake and gas pedal using levers that are typically mounted below the steering wheel and many types of hand controls and it is important.



to speak to a NMEDA dealer to find which best suits gear needs.

STEERING WHEELS:-

The steering wheel of a vehicle is the wheel which the driver holds when he or she is driving. The wheels on the car turn 20° during one rotation of the steering wheel. The front wheels are steering via rods connected to the steering wheel.

HAND BRAKING:-

In road vehicles the parking brake, also known as a hand brake or emergency brake (E-brake), is the mechanism used to keep the vehicle securely motionless when parked. parking brake often consist of a pulling mechanism attached to a cable which is connected to two wheel brakes.

HORN:-

A horn is a sound-making device that can be equipped to motor vehicle, buses, bicycles, trains, trucks and other types of vehicles. The sound made usually resembles a "honk" or a "beep". The driver uses the horn to warn others of the vehicle.



approach or presence, or to call attention to some hazard.

LIGHT:-

These lights allow the drivers to see the roadway in the dark, while also signaling to other motorists that a car is present. Low beams provide a light distribution to give adequate forward and lateral illumination without blinding other road users with excessive glare.

WIPER:-

A windscreen wiper, windshield wiper, wiper blade (American English) or simply wiper is a device used to remove rain, snow, ice, washer fluid, water, dust, from a vehicle's front window.

IGNITION SWITCH:-

An ignition switch, starter or start switch is a switch in the control system of a motor vehicle that activates the main electrical systems for the vehicle, including "Accessories".

STARTER:-

A starter is a device used to rotate crank an internal combustion engine so as to initiate



The engine operation under its own power. Starters can be electric, Pneumatic or Hydraulic

DIPPER :- (LOW BEAM)

Can dipper is changing the beam of head light in order to give a signal. Can dipper is used to signal the vehicles in front of your car to give you the space to overtake. It is generally used at night time. You must be use dipper during night time on high way to let another driver know that you are overtaking.

INDICATOR :-

Indicator lights, indicator lights are amber in colour and can be located at the front, the rear and some times at the side of the car on the both the left and right hand sides. You use your infection, whether turning left or right or moving out into traffic.

OTHER CONTROLS :-

REAR VIEW MIRROR :-

In car, the rear view mirror is usually a fixed to a top of the wind shields on a double swivel mount allowing it to be adjusted to



a top of the wind shields on a double swivel mount allowing it to be adjusted the height and viewing angle of any driver and to swing harmlessly out of the way if impacted by a vehicle occupant in a collision.

RIGHT SIDE MIRRORS:-

A side view mirror, also known as a wing mirror, is a mirror placed on the exterior of motor vehicles for the purpose of helping the driver see areas behind and to the sides of the vehicle outside the driver's peripheral vision.

LEFT SIDE MIRRORS:-

The outside rear-view mirror also known as the side mirror, is an exterior component in a car which is used by the driver to see view at side and behind while driving.

INSTRUMENT CLUSTER:-

A car's instrument cluster houses the various displays and indicators that enable a driver to operate the vehicle. Among these are several gauges - often a speedometer, tachometer, oil pressure gauge, fuel gauge etc. as well as



Various indicators for system malfunctions and Warnings.

GAUGES:-

The minimum number of gauges a passenger car dashboard are the Speedometer and the fuel gauge. The most common addition gauge followed by the tachometer, voltmeter and oil pressure gauge.

WIND SCREEN:-

Wind shields protects the vehicle's occupants from wind and flying debris such as dust, insects, and rocks and provides an aerodynamically formed window towards the front. The coating maybe applied to screen out harmful ultraviolet radiation.

CONCLUSION:-

Above this experiment we study that the vehicle Control on foot controls, Hand controls and other controls.

Subhash
29/2/24

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GOVERNMENT POLYTECHNIC, BALANGIR



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Subject. ELECTRIC VEHICLE LAB.

GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF Auto mobile



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02	case study about the four different vehicle brands four vehicle for economic and environmental analysis	12.02.2024	08 - 13	<i>[Signature]</i> 19/2
03	Study about inspect and install inverter of given lead acid battery	19.02.2024	14 - 22	<i>[Signature]</i> 24/2
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GOVERNMENT POLYTECHNIC, BALANGIR

DEPARTMENT OF AUTOMOBILE



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AIM OF THE EXPERIMENT:-

Study about block diagram of Electric vehicle and identify parts.

MAJOR PARTS OF THE ELECTRIC VEHICLE

- ① Motor
- ② Power Pack (Batteries)
- ③ Charger
- ④ Controller
- ⑤ DC/DC Converter.
- ⑥ Energy Management System (EMS)

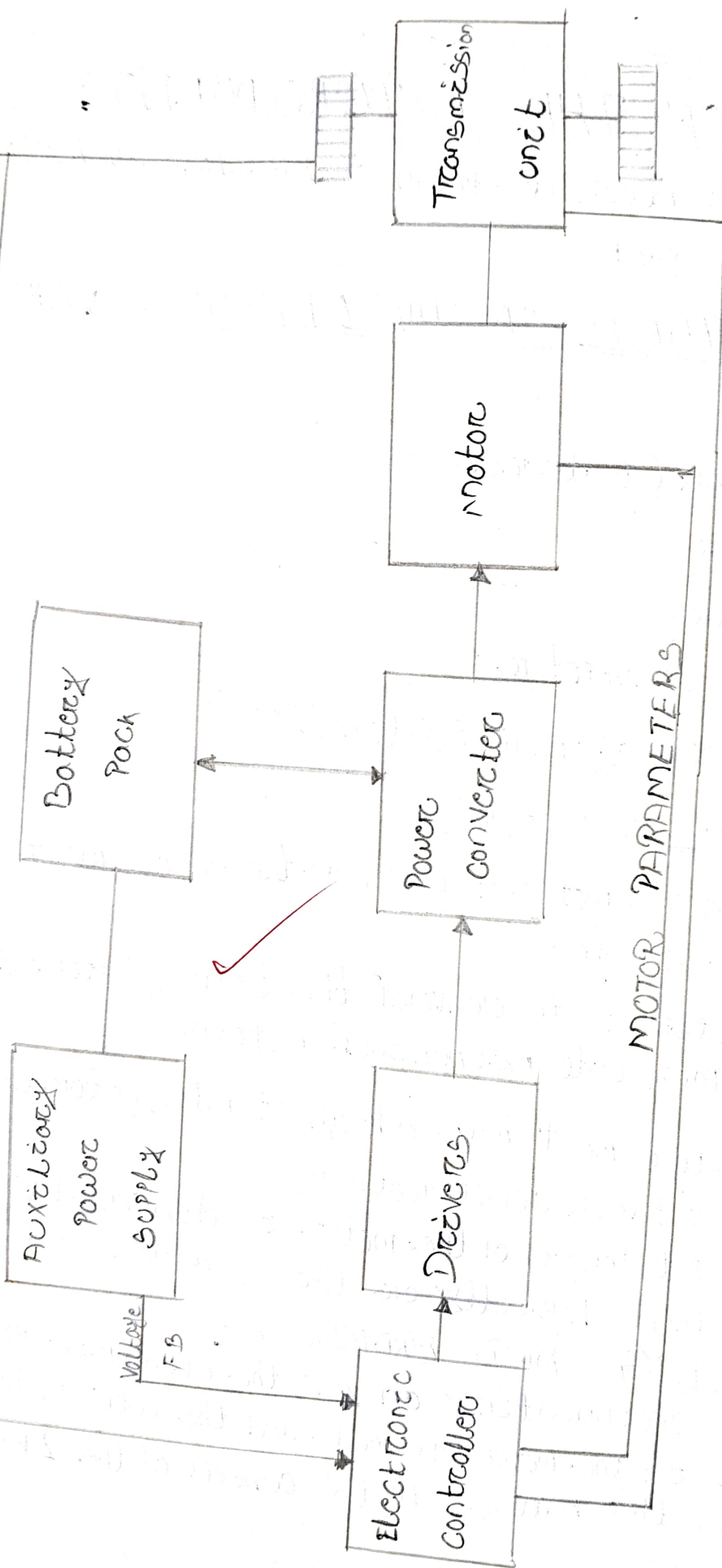
① Electric Motor:-

- * The electric motor is used as the prime mover in an Electric vehicle.
- * Its function is to convert the energy stored in the battery pack into mechanical motion.
- * This motor must have a high starting torque, to ensure a quick acceleration.
- * The output power of the motor is delivered to the wheels either directly or through a transaxle.

MOTORING AND BRAKING:-

- * While accelerating an E.V. the electric motor operates in the motoring mode and the flow of power is from the battery to the wheels of the E.V.

Speed feed back





* Hence the battery discharges in the motoring mode. However, while braking an EV, the motor acts as a generator (Regenerative braking) and the flow of power take place from the wheels of the EV to the battery.

* Hence the batteries get charged during the braking.

TYPES OF MOTORS:-

* There are different choices of electric motors for EVs.

* It is possible to use DC as well AC motor for an EV.

* AC motors offer many control advantages over the DC motors.

* But they need to use as inverter for converting the DC power from the battery into AC power. A DC shunt or separately excited motor can also be used. The power rating of such motor for smaller vehicles is up to 50kW.

* The electric coo reva uses a 13kW DC separately excited motor which can produce a 70Nm starting torque.

② POWER PACK:- (Batteries)

* Batteries are probably the most important component of an EV because it determines the weight, and cost range and performance of EV.



* The batteries used for EVs are rechargeable.

TYPES :-

* The following three batteries are used in different EVs.

① Lead-acid Batteries.

② Nickel-Metal Hydride (NiMH) Batteries

③ Lithium-Ion (Li-ion) batteries.

* All these are heavy battery space.

* The main advantage of using lead-acid batteries is that it is a matured technology accepted by the motor industry.

* However its disadvantage is its large weight and large space requirement.

* Lithium-ion batteries are the latest ones and they have many advantages like small size, long life, quick charging, etc.

* Generally the battery pack is housed beneath the front seats in an electric car because this lowers the center of gravity of the car and improves the safety of passengers.

* The EV batteries can be recharged by directly plugging them into the 220V, 15A sockets at home or work place.

* This type of charging need about 2.5 hours for 80 percent



charging and about 8 to 9 hours for full charging

(3) CHARGER:-

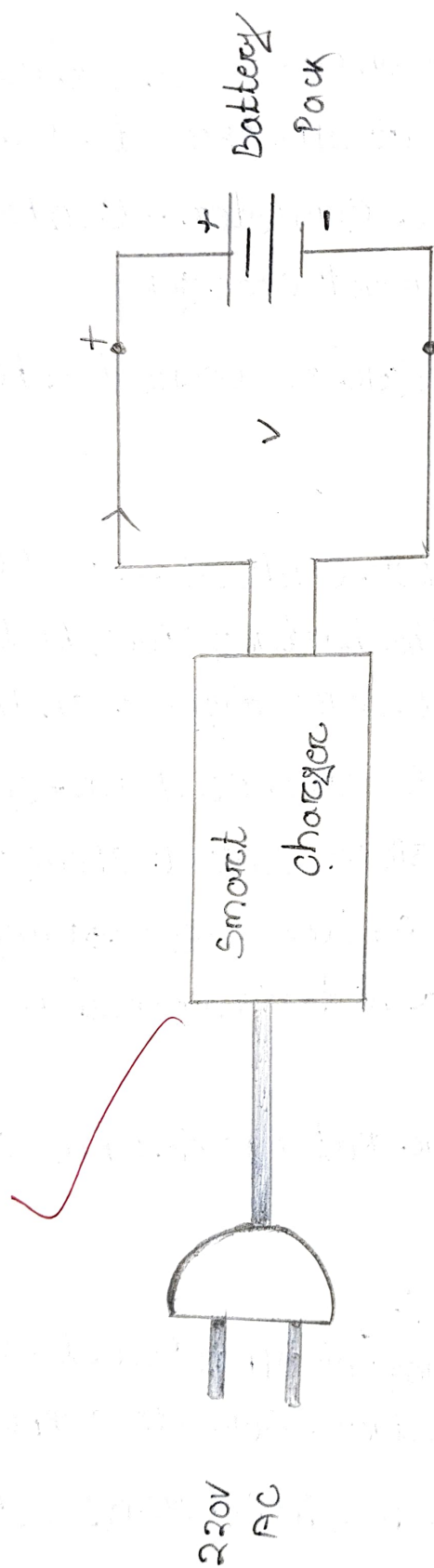
- * The on board charge of an EV is used for converting the AC supply to DC voltage of appropriate value.
- * All these chargers are computer - controlled therefore they are called smart chargers.
- * The out put of the charger is connected to the battery pack as shown in fig.

(4) CONTROLLER:-

- * The function of the motor controller is to regulate the power flow from the battery pack to the motor in proportion to the pressure applied on the accelerator.
- * The controllers used in EVs are computer-controlled.
- * They provide perfect speed control along with optimum use of energy while accelerating and braking.
- * Thus controllers allow a bidirectional transfer of energy.
- * The controller Power Rating depends on the voltage and current ranges.

(5) DC/DC CONVERTER:-

- * An auxiliary battery of appropriate voltage is normally used in electric cars to supply power to all accessories like lights, horns, etc.





* Therefore EVs used a DC-DC converter which takes its input from the main battery and produces a 13.5V at its output which is used to charge the auxiliary battery.

* It is advisable to use the auxiliary battery because if the main battery is drained below its lowest value then the auxiliary battery can be used to bring back the car home.

(B) ENERGY MANAGEMENT SYSTEM (EMS) :-

* EMS is the brain of EVs. As it monitors and controls all the required functions of EV.

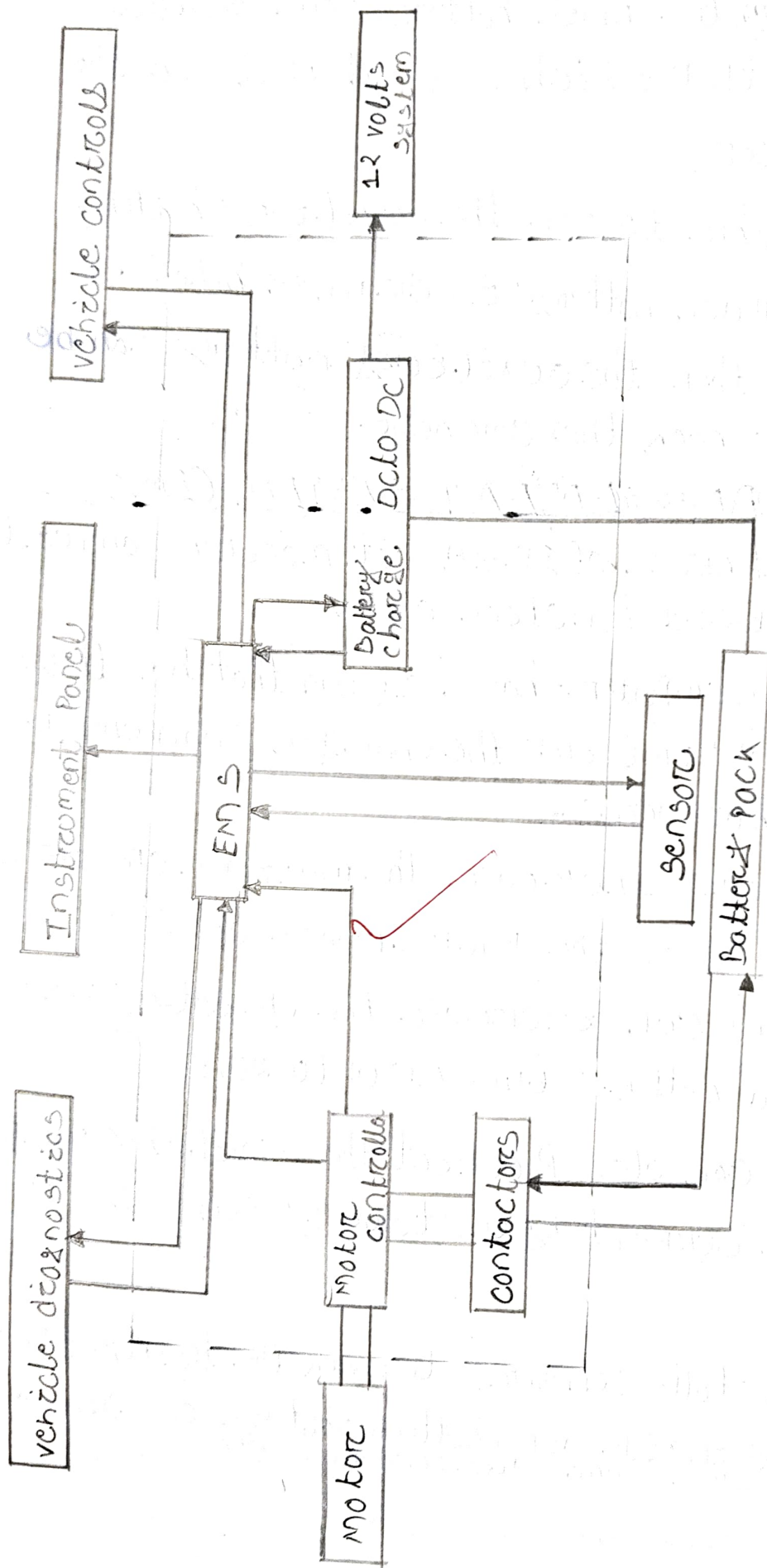
* The EMS is a computer-based system that has the main function of optimizing the charging and energy output of the batteries.

* By doing so EMS increases the maximum operating range and improves the performance of EVs.

* These systems can increase the operating range by up to 15% and battery life by up to 25%.

* The EMS can also predict the available range based on the current by installing sensors in them.

* It can install sensors to check the temperature of outside and inside air, battery voltage, charging current, vehicle speed and acceleration etc.



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THE FUNCTION OF EMS:-

* The EMS Can perform the following function

1. Optimizing the energy flow in both direction
 2. Prediction of available range.
 3. Detecting the ~~ext~~ regenerative energy from wheels to battery during braking operation
 4. To adjust the internal temperature by sensing the outside air temperature.
 5. To adjust the light brightness by sensing the external lighting conditions.
 6. Proposing a suitable algorithm from battery charging
 7. fault diagnoses in the components of the components of the subsystems.
- * It is also possible to couple EMS with a navigation system that can help in locating charging facilities.



CONCLUSION

Above this experiment we study that the
Develop block diagram of Electric vehicle and
identify ports

Sp
12/2/2024

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BRANCH:- Automobile
SEMESTER:- 6th
DATE:- 10/02/2024



EXPERIMENT NO.:-

AIM OF THE EXPERIMENT

Case study about the four different vehicle brands
four vehicle for economic and environmental analysis

THEORY:-

4-different Brand's vehicle:-

- ① Hyundai → New Hyundai Verna
- ② Honda → Honda City
- ③ Maruti Suzuki → Jimny
- ④ Maruti's Gadages → Astor
- ⑤ Tata → Tigor EV

1. HYUNDAI:-

Hyundai, a leading south korea automobile manufacturer has been operating in india since 1996. Its known for producing a wide range of cars from hatch backs like sedan to suv like the creta. Hyundai has manufacturing facilities in Chennai and Sri Perumbudur, Tamil Nadu.

NEW HYUNDAI VERNA:-

- Mileage → 18.6 to 20.6 kmpl
 Fuel type → Petrol
 Engine Displacement → 1497 CC
 No of Cylinder → 4 Cylinder
 Maximum Power → 11.5 - 18 bhp @ 6300 rpm.



Maximum Torque $\longrightarrow$ 143.8 NM @ 4500 RPM
Seating Capacity $\longrightarrow$ 5
Transmission Type $\longrightarrow$ Manual / Automatic
Fuel Tank Capacity $\longrightarrow$ 45 Liters
Ground Clearance $\longrightarrow$ 170 mm ✓

PRICE:-

The Hyundai New Verna Price are expected to range between Rs 11.00 $\longrightarrow$ 17.42 Lakh depending on the variants.

② HONDA :-

Honda, established by Soichiro Honda and Takeo Fujisawa in 1946, initially produced motorized bicycles. In 1963 Honda introduced its first car, the T360 mini-truck, marking its entry into the automotive industry. The Honda Civic, launched in 1972, became a global success, solidifying Honda's reputation for reliability and fuel efficiency. Today Honda is renowned for its diverse range of automobiles.

HONDA CITY:-

Mileage $\longrightarrow$ 18 to 27 kmpl
Fuel Type $\longrightarrow$ Petrol / Diesel
Engine Displacement $\longrightarrow$ 1498 CC
No of Cylinders $\longrightarrow$ 4 cylinders
Maximum Power $\longrightarrow$ 119.35 bhp @ 6600 R.P.M
Maximum Torque $\longrightarrow$ 145 NM @ 4300 R.P.M



Seating capacity $\longrightarrow$ 5 person

Transmission type $\longrightarrow$ Automatic/manual

Fuel tank capacity $\longrightarrow$ 40 liter

Ground clearance $\longrightarrow$ 165 mm

PRICE:-

The Honda City Prices are expected to range between Rs 11.81 — 16.29 Lakh depending on the variant

(3) MARUTI SUZUKI:-

Maruti Suzuki established in 1981 as a collaboration between the Indian government and Suzuki Motor Corporation of Japan, revolutionized the Indian automobile industry. The iconic Maruti 800 launched in 1985, became India's first mass-produced car. Maruti Suzuki's commitment to quality, affordability and innovation has made it the

in the Indian automotive market offering a wide range of vehicles catering to diverse consumer needs.

JIMNY:-

Mileage $\longrightarrow$ 16.39 km/l

Fuel type $\longrightarrow$ Petrol

Engine Displacement $\longrightarrow$ 1462 CC

No of cylinders $\longrightarrow$ 4 cylinders

Maximum power $\longrightarrow$ 103.39 bhp @ 6000 R.P.M



Maximum Torque $\longrightarrow$ 154.2 Nm @ 4000 r.p.m.
 Seating Capacity $\longrightarrow$ 4 seater
 Transmission Type $\longrightarrow$ Automatic / manual
 Fuel tank capacity $\longrightarrow$ 40 Liters
 Ground clearance $\longrightarrow$ 210 mm.

PRICE:-

The Maruti Suzuki Prices are expected to range between Rs. 12.74 — 14.95 Lakh depending on the variant.

(4) MORRIS GARAGES:-

Morris Garage (MG) a British automotive brand traces its origins to 1924. known for producing sports cars MG gained prominence with models like the MGB and MG Midget. After ownership changes MG is now under Chinese ownership producing a range of vehicles including SUVs and electric cars, revitalizing its legacy in the automotive industry.

ASTOR:-

Mileage $\longrightarrow$ 15.43 km/l
 Fuel Type $\longrightarrow$ Petrol
 Engine Displacement $\longrightarrow$ 1498 cc
 No of Cylinders $\longrightarrow$ 4 Cylinders
 Maximum Power $\longrightarrow$ 108.49 bhp @ 6000 rpm



Maximum Torque —————> 144 Nm @ 4400 rpm
Seating Capacity —————> 4 seater
Transmission Type —————> Manual/Automatic
Fuel Tank Capacity —————> 48 Liters
Ground Clearance —————> 180 mm.

PRICE:-

The motor's Gorges Astor are expected to range between Rs. 9.98 — 17.90 lakh depending on the variant.

TATA (EV):-

Tata motors an Indian automobile company has ventured into the electric vehicle (EV) segment tata tiago EV, these electric vehicles offer eco-friendly transportation option with zero tail pipe emission. Tata motors in india aims to contribute to sustainable mobility in india by promoting the adoption of electric vehicles as parts of its product lineup.

TATA TIAGO EV:-

Tata tiago EV has 1 electric engine on offer it is available with the automatic transmission the tiago EV is 5 seater and has length of 3769 mm. width of 1677 mm and a wheelbase of 2400 mm.



Charging time $\longrightarrow$ 6 Hours 55 minutes / 7.2 kWh (b-100)

Battery Capacity $\longrightarrow$ 24 kWh

Maximum Power $\longrightarrow$ 73.75 bhp

Maximum Torque $\longrightarrow$ 114 Nm

Seating Capacity $\longrightarrow$ 5 seats

Range $\longrightarrow$ 315 km

Boot space $\longrightarrow$ 240 litres

PRICE:-

Tata Tigo EV Price for the base model starts at Rs 7.99 lakh and the top model price goes up to Rs 11.89 lakh.

CONCLUSION:-

From the above experiment we study about the 4 different brand's vehicles for economic and environmental analysis.

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19/2/24

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BRANCH:- Automobile

SEMESTER:- 6th

DATE:- 12.02.2024