BHARTIYA SKILL DEVELOPMENT UNIVERSITY

Registration No.: .....

School of Automotive Skills

Session: 2020-21 (Winter Semester)

CO P

M. Voc. Program, 3rd Semester,

1st In-Sem. Examination

Course Code: AUT-2303 **Time: 1 Hour**

Course Name: Automotive Electric Vehicle **Max. Marks: 20**

Instruction: (if any) No

Section – A

05X01 = 05 Marks

1. Which of the followings is not the type of hybrid vehicle:
   a) Plug in hybrid
   b) Parallel hybrid
   c) Natural gas for vehicle
   d) Series hybrid
2. The hybrid electric vehicle consists of:
   a) Internal combustion engine + electric motor
   b) NGV engine +gasoline engine
   c) Motor electric 1+ motor electric 2
   d) None of the above
3. Select the features of hybrid electric vehicles:
   a) Idle stop
   b) EV drive
   c) Motor assist
   d) Regenerative brake
4. The electric motor in a hybrid car can also act as:
   a) Cooling fan
   b) Fuel pump
   c) Generator
   d) None of the above
5. A .....is a vehicle that can run on just the engines, just the batteries, or a combination of the two:
   a) Mild hybrid
   b) Full hybrid
   c) Fuel cell
   d) Assist hybrid

Section – B

03X02 = 06 Marks

Q1 Explain electric vehicle.

Q2 Write down the need, advantages of electric vehicle.

Q3 Write down the components/inner parts of an electric vehicle.

Section – C

03X03 = 09 Marks

Q1 Differentiate between electric vehicle, hybrid electric vehicle, plug in hybrid electric vehicle and gasoline vehicle.

Q2 Explain different types of motors used in electric vehicle.

Q3 Explain configuration and control of DC motor drive.

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School of Automotive Skills

Session: 2020-21 (Winter Semester) Answer Key A'K.

M. Voc. Program, 3rd Semester,

1st In-Sem. Examination

Answer key

Course Code: AUT-2303 **Time: 1 Hour**

Course Name: Automotive Electric Vehicle **Max. Marks: 20**

Instruction: (if any)

Section – A

05X01 = 05 Marks

1. d
2. b
3. B
4. C
5. d

Section – B

03X02 = 06 Marks

Q1

Electric vehicles (EVs), also called battery electric vehicles (BEVs), are propelled by an electric motor (or motors) powered by rechargeable battery packs. No other fuel source is used, and there is no internal combustion engine (ICE). EVs require battery charging to power the motor.

Q2

Energy-efficient driving. Electric motors convert 75% of the chemical energy from the batteries to power the wheels, while ICEs only convert 20% of the energy stored in gasoline.

Environmentally friendly driving. EVs emit no tailpipe pollutants, although the power plant producing the electricity may emit carbon dioxide or other GHGs. Electricity from nuclear-, hydro-, solar-, or wind-powered plants creates no air pollutants.

Performance benefits. Electric motors provide quiet, smooth operation and stronger acceleration while requiring less maintenance than ICEs.

Reduced dependence on imported energy. Electricity is a domestic energy source in many countries, as opposed to oil.

Q3

- EVs have 90% less moving parts that an ICE (Internal Combustion Engine) car. Here's a breakdown of the parts that keep an EV moving:
- **Electric Engine/Motor** - Provides power to rotate the wheels. It can be DC/AC type, however, AC motors are more common.
- **Inverter** - Converts the electric current in the form of Direct Current (DC) into Alternating Current (AC)

- **Drivetrain** - EVs have a single-speed transmission which sends power from the motor to the wheels.
- **Batteries** - Store the electricity required to run an EV. The higher the kW of the battery, the higher the range.
- **Charging** - Plug into an outlet or EV charging point to charge your battery.

Section – C

03X03 = 09 Marks

Q1

A **hybrid vehicle** gets its energy simultaneously from a gasoline engine and an electric motor. The engine and the motor work together to power the car; this helps to increase your fuel economy ratings (i.e. how many miles you can travel with one gallon of gasoline). The engine also uses gasoline to help recharge the vehicle's battery, which powers the electric motor.

A **plug-in hybrid vehicle (PHEV)** also uses a gasoline engine and an electric motor, but in different ways. The plug-in hybrid runs primarily using its electric motor, powered by the battery. A plug-in hybrid won't tap into your gas tank until the battery runs out of power. Instead of the electric motor and the engine working together at the same time, a plug-in hybrid uses its engine as a backup plan.The distance you can travel before this happens is often advertised as a vehicle's all-electric range. Once the battery runs out of power, it has to be charged using a plug-in electric charger; the engine does not recharge a plug-in hybrid's battery.

Q2

- DC Series Motor. It was a widely used motor back in the 1990s. ...
- **Brushless DC Motor (BLDC) BLDC** used in Aether Scooters. ...
- Permanent Magnet Synchronous Motor (PMSM) PMSM in Toyota Prius. ...
- Three Phase **Induction Motor**.

Q3

The **DC motor drive** is a type of amplifier or power modulator that integrate between the **controller** and a **DC motor**. It takes the low current and then converts it into a high current which is appropriate for the **motor**.

Armature voltage control

Field flux control

Armature resistance control

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School of Automotive Skills

Session: 2020-21 (Winter Semester)

M. Voc. Program, 3rd Semester,

1st In-Sem. Examination

QP

Course Code: AUT-2306 **Time: 1 Hour**

Course Name: Vehicle Dynamics **Max. Marks: 20**

Instruction: (if any) No

Section – A

05X01 = 05 Marks

1. Wheel base of a vehicle is the:
   a) Distance between the centers of the front and rear wheels
   b) Distance between the centers of the fronts tyres
   c) Distance between the centers of the rear tyres
   d) Extreme length of the vehicle
2. The vehicle ride will be comfortable if:
   a) Unsprung mass is kept minimum
   b) Sprang mass is kept minimum
   c) Vehicle mass is kept minimum
   d) All of the above
3. Caster is a:
   a) Forward tilt of the kingpin
   b) Backward tilt of the kingpin
   c) Either A or B
   d) None of these
4. A traction control system in automobile controls the:
   a) Vibration on the steering wheel
   b) Engine power during acceleration
   c) Torque that is transmitted by the tyres to the road surface
   d) stopping distance in case of emergency
5. The effect of having excess camber is:
   a) Excess steering alignment torque
   b) Hard steering
   c) Too much traction
   d) Uneven tyre wear

Section – B

03X02 = 06 Marks

Q1 Explain Vehicle dynamics.

Q2 Differentiate between friction force and traction force.

Q3 Draw diagram showing various forces acting on vehicle during uphill.

Section – C

03X03 = 09 Marks

Q1 Differentiate between caster angle and camber angle.

Q2 Explain center of mass, center of gravity, and centroid.

Q3 Write down factors affecting vehicle dynamics.

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School of Automotive Skills

Session: 2020-21 (Winter Semester) Answer Key

M. Voc. Program, 3rd Semester,

1st In-Sem. Examination Answer Key A.K.

Course Code: AUT-2306 **Time: 1 Hour**

Course Name: Vehicle Dynamics **Max. Marks: 20**

Instruction: (if any)

Section – A

05X01 = 05 Marks

1. d
2. b
3. B
4. C
5. d

Section – B

03X02 = 06 Marks

Q1 Vehicle dynamics is a complicated analytical and experimental technology that is used to study and understand the responses of a vehicle in various in-motion situations. In the driver education field, it is not necessary to deal with the specifics of this technology but rather with some of the basic physical principles involved in it.

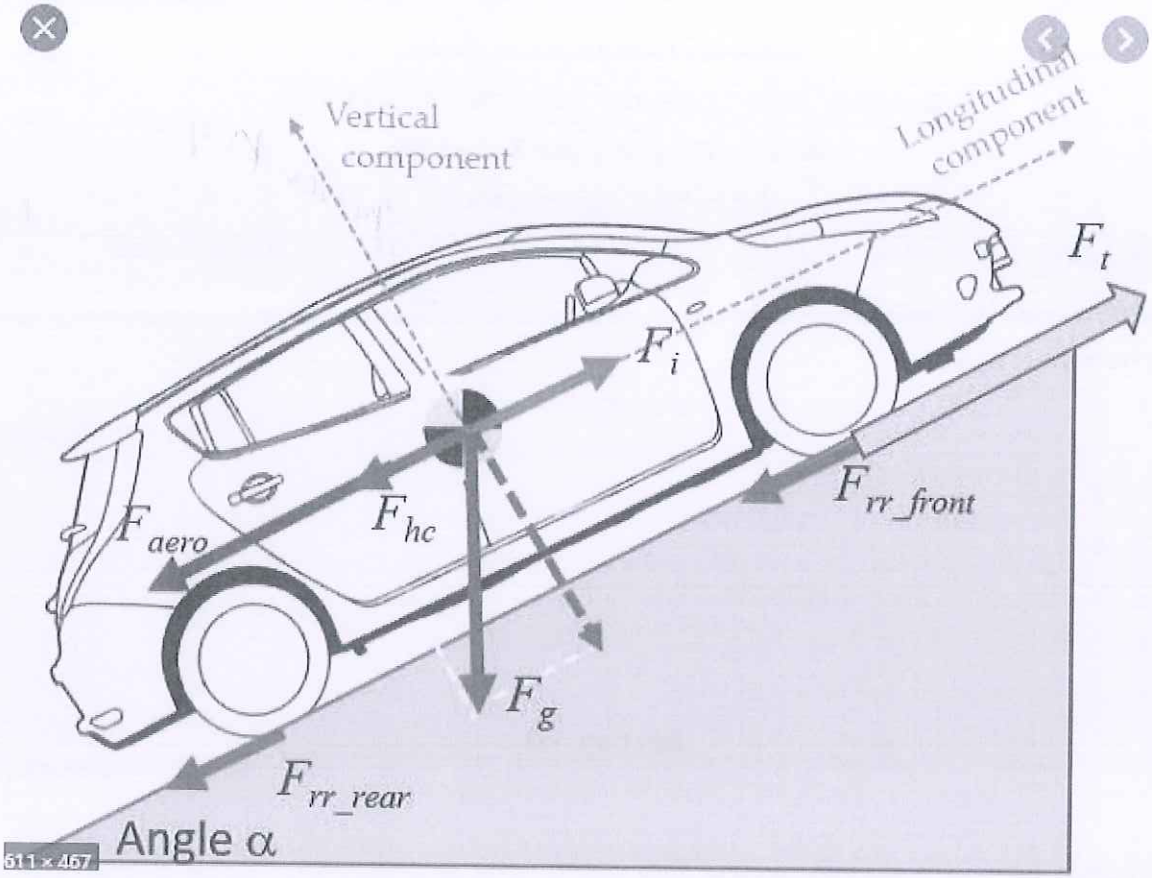
Q2 Friction:

- Resistance to motion between two surfaces
- Types
  - Static
  - Sliding
  - Rolling
  - Internal

Traction:

- Adhesive friction between tires and road surface
  - Driving traction – acc
  - Braking traction
  - Cornering traction

Q3

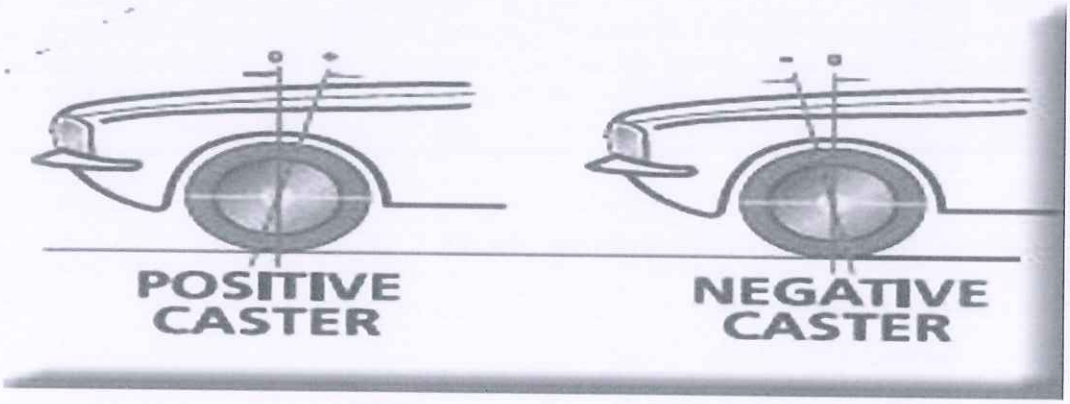


Section – C

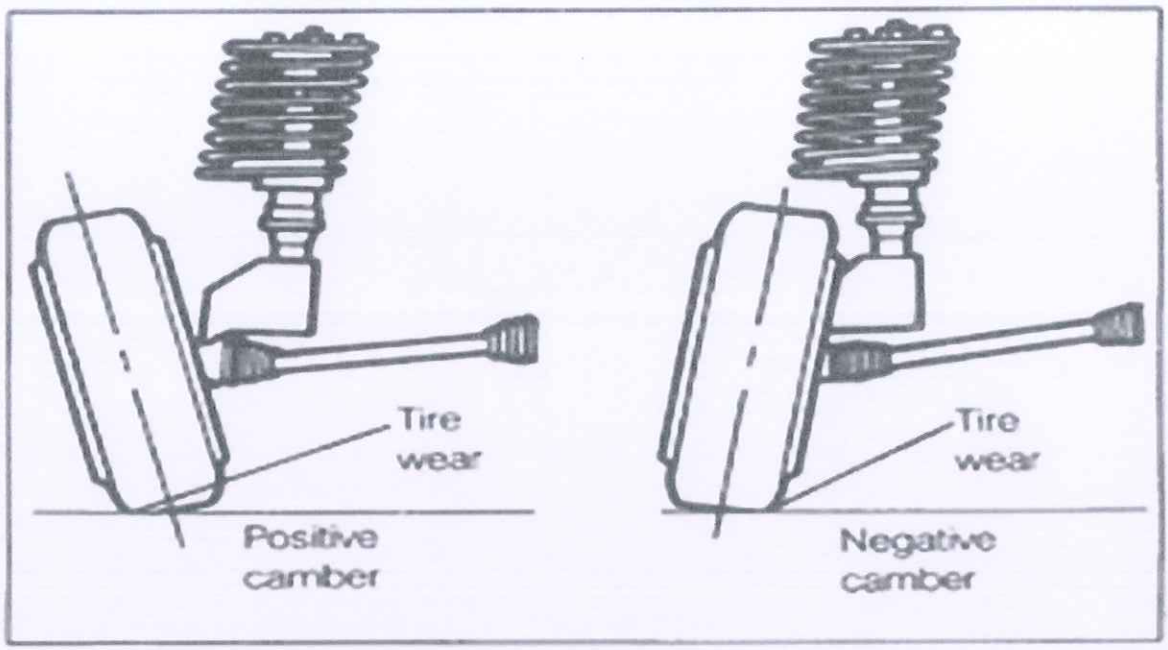
03X03 = 09 Marks

Q1

- The caster angle or castor angle is the angular displacement of the steering axis from the vertical axis of a steered wheel in a car, motorcycle, bicycle, other vehicle or a vessel, measured in the longitudinal direction.



- Camber angle is the angle made by the wheels of a vehicle; specifically, it is the angle between the vertical axis of the wheels used for steering and the vertical axis of the vehicle when viewed from the front or rear. It is used in the design of steering and suspension. If the top of the wheel is farther out than the bottom (that is, away from the axle), it is called positive camber; if the bottom of the wheel is farther out than the top, it is called negative camber.



Q2 a) Center of mass: it is the point where whole mass is to be concentrated.

Center of Gravity: it is the point where whole weight of a body is to be concentrated.

Centroid: it is the point where whole weight of a area/shape is to be concentrated.

Q3

Factors affecting vehicle dynamics:

- Chassis & or frame
- Drivetrain
- Braking
- Suspension
- Steering
- Mass distribution
- Aerodynamics
- Tires