

JK Lakshmipat University Jaipur
INSTITUTE OF ENGINEERING AND TECHNOLOGY

End Term Examination, May 2022
MTech. (AR), Semester II, 2021-2022

Roll No.....

EE1220: Electric Vehicle Technology

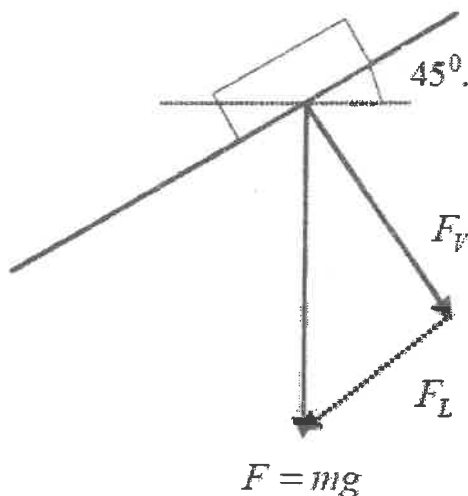
Time: 2:30 hours

Max. Marks: 30

Instructions to students:

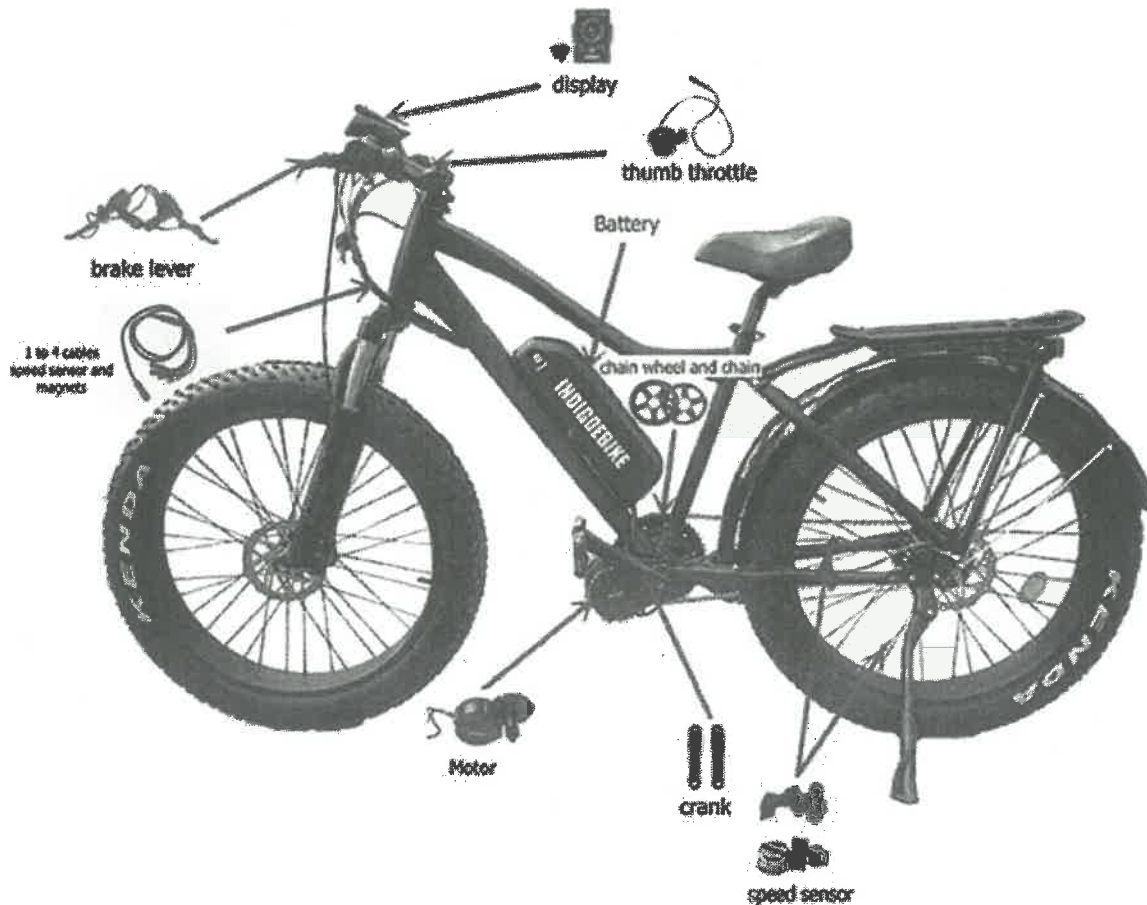
1. Do not write anything other than your roll number on question paper.
2. Mention all the assumptions for your answers clearly.

- Q. 1. An Electric car has the following parameter values: 05
(LO3)
 $m = 500 \text{ kg}$, $C_D = 0.1$, $A_F = 2 \text{ m}^2$, rolling coefficient = 0.001, density of air = 0.5 kg/m^3
and acceleration due to gravity = 10 m/s^2 . A single motor mounted on the front wheels
drives the car, and the radius of the wheel is 04 m. The car is going uphill at a speed of 90
km/hr, and the slope of the hill is 45° .



- (i) Calculate the power developed by the motor. Ignore the motor losses.
 - (ii) Assume that car takes 5 minutes to reach the top of the hill, while running at a constant speed of 90 km/hr. Calculate the energy generated by the motor of the car.
- Q. 2 Draw six different configurations of drivetrains in electric vehicles. Brief the requirement of each configuration. 03
(LO2)

- Q. 3 In an electric bike as below, electric motor is supplied power to its wheels through 5:1 gear system. Here efficiency of gear system 90%, tension at wheel point 1000N and radius wheels is 0,5m. 04
(LO3&4)



Determine

- (i) power rating and the required speed range of the motor to drive the bike at a speed of 100 km/Hr.
- (ii) power output from battery required if motor have an efficiency of 80%.

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- Q. 4 Elaborate energy management system and issues of energy management strategies of hybrid electric vehicle. 03
(LO1)
- Q. 5 With functional block diagram Discuss architecture of EV and charging infrastructure. 03
(LO-5)
- Q. 6 A 3 kW BLDC motor is used to drive a light two-wheeled electric vehicle. This motor is fed through a 3-phase controller (Voltage operation range 36 V to 95 V) and can deliver up to 80 A of current. Design a battery pack using below cell details. Also, consider the designed battery pack is 84 V with the capacity of 27.5 Ah. 05
(LO-4)
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Table 1. Parameters of the SONY US18650VTC5 C5 2600mAh cell

Parameter	Value
Nominal capacity	2500 mAh
Maximum voltage	4.2 V
Nominal voltage	3.6 V
Minimum voltage	2.0 V
Charging voltage	4.2 V
Maximum charging voltage	4.25 V
Charging current	2.5 A
Maximum charging current	4.0 A
Maximum continuous discharging current	10 A
Discharge current intensity at a temperature below 80 °C	30 A (<10 sec.)
Discharge current intensity at a temperature above 80 °C	20 A (<10 sec.)
Safe discharging current	10 A (> 10 sec.)
Weight	44.3 g
Charging temperature	0 ÷ + 45 °C
Discharge temperature	-20 ÷ +60 °C

- Q. 7 Electric vehicles (EVs) look to be a good option for a greener tomorrow, but modes of battery use remain to be sorted out. Discuss problems associated with swappable battery to the electric vehicle. 02 (LO-5)
- Q. 8 There are three primary types of charging station for Electrical Vehicles. Electrical vehicles establish connection with charging station through connectors. Discuss in detail about connectors used for fast charging and slow charging process. 05 (LO-3)

all the best!

