Battery

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Class	IGVC

Electrical Subsystem

Q2)

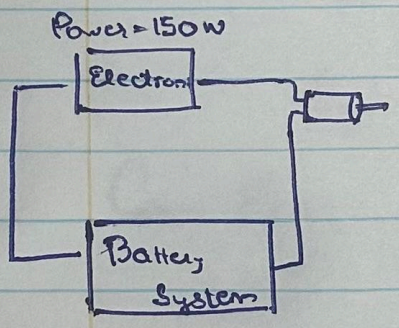
Electrical Subsystem:

Q2) Battery Calculations

Since the voltage requirement is 48V and each battery is only 24V we will have to connect two bateries in series to get 48 V.

We know that Capacity = I × t ⇒ atleast 2hrs

$$C\,rate = \frac{Discharge\ Current}{Battery\ Capacity}$$



Calculating normal Energy requirement.

Power Consumption:

1. Nominal current drow = 30A
   Voltage requirement = 48V
   Power = VI = 48×30 = 1440W

Power consumed by electronics = 150W

Total power Consumption (without Efficiency)

= 150 + 1440

= 1590W

Considering efficiency

$\frac{82}{100} \times P_{actual} = 1590$

$P_{actual} = \underline{1939W}$

Energy for 2 hours = Pt

= 1939 x 2 Wh

= 3878 Wh

Capacity $= \frac{3878}{48} = \underline{80.79}$

Adjust for Vehicle Weight Increase.

15% increase in current draw.

$I_{new} = 30 \times 1.15 = 34.5$

New power (motor) = 34.5 x 48 = 1656 W

Total power consumption = 1806 W

New energy required $= \frac{1806 \times 100}{82} \times 2$

$= 2202.4W \times 2$

$= 4404.8W$

New capacity

$= \frac{4404.8}{48} = 91.76Ah$

Since for two batteries in series only voltage increases whereas capacity remains constant, thus we will have to use a parallel because the highest capacity battery we have cannot satisfy this requirement.
{67 < 91.76}.

Since any battery can satisfy this, we use the next selection criterion that is ability to handly peak current requirement and clearly Option F has the highest discharge current using

Discharge current = C-rate x Capacity = 67×0.65

$= 43.55A$

And since we are connecting two (sets of series) in parallel, max current output becomes = 2 × 43.55
= 87.1 A

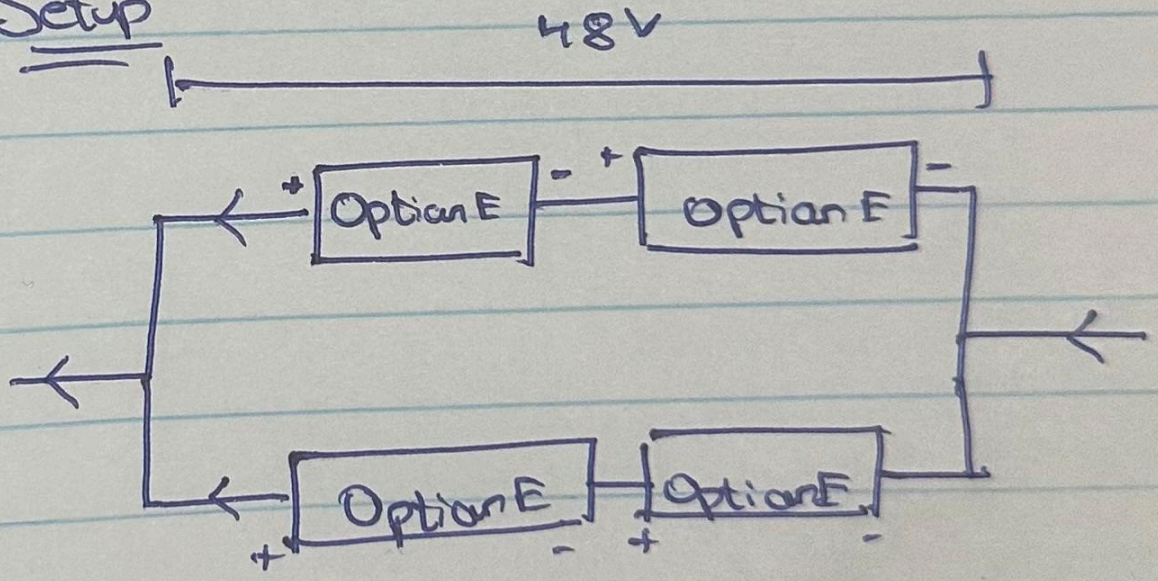
Peak motor current = 47 × 1.15
(including 15% extra) = 54.05

which is more than satisfied by this e. setup.

Final Concluding

Batteries used - Battery - Option-E

Setup



Battery Chosen - OPTION E {to optimize capacity and discharge current to accommodate peak motor current}

Setup - 2 sets of (2 batteries in series) in parallel.