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8 Assume that you have a cells of lithium ion cell of 2V and you have to achieve a battery pack with 12V nominal voltage, which configuration will you choose.

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9. If an electric vehicle needs to provide 400 hp for 1hr and the vehicle's battery voltage is 300V, what is the rating of battery capacity in ampere hours?

$$1 \text{ hp} = 750 \text{ W} \quad \text{power}$$

Capacity is Ah

$$400 \times 750 \text{ W} = 3,00,000 \text{ W}$$

$$P = VI$$

$$I = 1000 \text{ A}$$

$$BC = Ah$$

$$= 1000 \times 1 \text{ hr}$$

$$BC = Ah$$

$$= 1000 \times 1hr$$

$$= 1000 Ah$$

8. Find capacity of battery to move the vehicle to 300 km at the speed of 80 km/hr with power rating of 5 kW. voltage rating : 48 V

$$S = \frac{d}{t}$$

$$80 = \frac{300}{t}$$

$$t = \frac{300}{80} = 3.75 \text{ hr}$$

$$5000 = \frac{VI}{48}$$

$$I = 104.16 \text{ A}$$

$$BC = Ah \quad (I \times t)$$

$$= 104.16 \times 3.75$$

$$= 390.625 \text{ Ah}$$

9. Calculate the speed of an electric good vehicle with battery capacity of 400 Ah, 600 HP and nominal



12:34 Sun, 31 Mar

48%

< Electric vehicle tech college

Q. Capacity of the battery to move the vehicle 400km at speed 100 km/hr with Power: 400HP & voltage of 30V

dist: 400 km  
speed: 100 km/hr  
Power: 400 HP  
Voltage: 30V

$$s = \frac{d}{t}$$

$$t = \frac{d}{s} = 4 \text{ hrs}$$

$$P = VI$$
$$\frac{400 \times 750}{30} =$$

$$I = 10,000 \text{ A}$$

$$BC = 40,000 \text{ A-hr}$$

10 from scope  
powertrain

- ① Research and data collection ES (sedan)
- ② Financial analysis
- ③ Environmental

27 Feb

A 200V DC series motor is drawing a line current of 25 Amp while running at 1200 rpm. The armature resistance is  $0.15 \Omega$  and the series field resistance is  $0.1 \Omega$ . Determine the back emf, power developed, power loss in the armature & overall efficiency.

$$V = E_b + I_a R$$

$$200V = E_b + 25 \times (0.25)$$

$$E_b = 193.5$$

$$\begin{aligned} \text{Power developed: } E_b I \\ &= 193.5 \times 25 \\ &= 4843.75 \end{aligned}$$

$$\begin{aligned} \text{Power loss: } I_a^2 R_a \text{ loss} \\ &= (25)^2 \times 0.15 \\ &= 156.25 \end{aligned}$$

$$\text{Overall efficiency: } \frac{O/P}{I/P} = \frac{4843.75}{4843.75 + 156.25}$$

$$I/P = O/P + \text{loss} = 0.96$$



Q. A 250V dc series motor runs at 1000 rpm when drawing a line current of 50 Amp. The armature & series field resistances are : 0.08  $\Omega$  & 0.05  $\Omega$  respectively. If current taken by the motor remains the same, determine the value of series resistance required to reduce the speed to 800 rpm. How to reduce / control speed of DC series motor.

$$\frac{n_2}{n_1} = \frac{E_{b2}}{E_{b1}}$$

$$E_b = V - I_a R \rightarrow R_a + R_f$$

$$E_{b2} = V - I_a r \rightarrow R_a + R_f + R$$

$$E_{b2} = 250 - 50(0.13 + R)$$

$$V = 250 \text{ V}$$

$$I_a = 50 \text{ A}$$

$$R_a = 0.08 \Omega$$

$$R_f = 0.05 \Omega$$

$$\frac{800}{1000} = \frac{243 - 50R}{242.5}$$

$$R = 0.964$$

Q. A 3 phase 400V, 4 pole, 50Hz induction motor is operating at 5% slip. What is the speed of the motor?   
  $\hookrightarrow$  syn speed - motor speed.

$$n_s = \frac{120f}{p} = \frac{120 \times 50}{4} = 1500$$

Q. A 3 phase 400V, 4 pole, 50 Hz induction motor is operating at 5% slip. What is the speed of the rotor ↳  $\frac{\text{syn speed} - \text{motor speed}}{\text{motor speed}}$

$$n_s = \frac{120f}{p} = \frac{120 \times 50}{4} = 1500$$

$$\text{slip} = \frac{n_s - n_r}{n_s}$$

$$0.05 = \frac{1500 - n_r}{1500}$$

$$n_r = 1425$$

Q. A 3 phase 440V 6 pole 60 Hz induction motor is running at — slip when the motor speed is 800 rpm.

$$\begin{aligned} \text{↳ } n_r \quad n_s &= \frac{120 \times 60}{6} \\ &= 1200 \end{aligned}$$

$$\begin{aligned} \text{slip} &= \frac{1200 - 800}{1200} \\ &= 0.3333333 \end{aligned}$$

Q. A 3 phase 440V 8 pole 50 Hz is running



$$\text{slip} = \frac{1200 - 800}{1200} = 0.3333333$$

Q. A 3phase 440V 8 pole 50Hz is running at slip of 5%. find out speed of stator magnetic field wrt rotor mf and speed of rotor wrt stator mf.

$$n_s = \frac{120 \times 50}{8} = 750$$

$$0.05 = \frac{750 - n_r}{750}$$

$$37.50 = 750 - n_r$$

$$n_r = 750 - 37.5$$

$$= 712.5$$

$$n_s - n_r = 37.5$$

Mid term questions