

1] MOTOR SELECTION:-

Based on our problem statement, we have found a motor which meets all specific parameters.

Selected Motor:- T Motor U7 V2.0 Kv420.

Following is the motor data:-

- 1] Motor Dimensions:- $\varnothing 60.7 \times 39.5 \text{ mm}$
- 2] Shaft Diameter (motor):- 6 mm
- 3] Wt. including all cables:- 296 g.
- 4] Wt. excluding cables:- 255 g
- 5] No. of cells:- 3-8 s
- 6] Max Power of Motor = 1180 W \approx 1.582 hp
- 7] Motor rpm = 13,320

Now we find input torque (Motor torque)

$$\text{FORMULA:- } \text{Torque (lb-feet)} = \frac{\frac{1}{2} \text{ Motor Power (hp)} \times 5252}{\text{Motor rpm}}$$

$$= \frac{1.582 \times 5252}{13320}$$

$$\text{Torque} = 0.623 \text{ lb-feet} \approx 0.8485 \text{ N-m}$$

2) Determination of overall speed reduction ratio:- and Speed reduction ratio for both stages.

Required Torque at output = $5 \text{ N-m} \approx 3.676 \text{ lb-feet}$.

$$\therefore \text{Output speed} = \frac{\text{Motor hp} \times 5252}{\text{Req. Torque (lb-feet)}}$$

$$= \frac{1.582 \times 5252}{3.676}$$

$$= 2260 \text{ rpm.}$$

Gear Reduction Ratio can be given by:-

$$i = \frac{\text{Input Speed}}{\text{Output speed}}$$

$$= \frac{13320}{2260}$$

$$= 5.89 \approx 6$$

Overall speed Reduction Ratio is 6.

Now we factorize overall speed reduction ratio 'i' to obtain speed reduction ratio for individual stages.

\therefore Speed Reduction Ratio for 1st stage = 3

\therefore Speed Reduction Ratio for 2nd stage = 2.

3] Design of Gears:- MATERIAL SELECTION.

- In order to design the gears for the first and second stage, we must first select material that is suitable for given application.
- Based on information provided in VB Bhandari Design Data book [Materials and their applications Table] we select AL 7075 for manufacturing all gears.
- Aluminium alloy AL 7075 is widely used in aerospace applications because of following reasons:-
 - 1] High Strength to Weight ratio
 - 2] Good fatigue resistance
 - 3] Corrosion Resistance
 - 4] ~~Good~~ Good Machinability
 - 5] Stress Corrosion Cracking resistance
 - 6] Heat treatability
 - 7] Low density.