

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 :- $\phi 60.7 \times 39.5$ 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 ≈ 1.582 hp
- 7] Motor rpm = 13,320

Now we find input torque (Motor torque)

$$\text{Formula :- } \text{Torque} = \frac{\text{Motor Power (hp)} \times 5252}{\text{Motor rpm}}$$

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

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

2] Determination of overall speed reduction ratio i and speed reduction ratios for both stages.

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

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

$$= \frac{1.582 \times 5252}{3.676}$$
$$= 2260 \text{ rpm.}$$

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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 Machinability
 - 5] Stress Corrosion Cracking resistance
 - 6] Heat treatability
 - 7] Low density.