1. The disk shown in Fig. 1 is originally rotating at \( \omega_0 = 8 \text{ rad/s} \). If it is subjected to a constant angular acceleration of \( \alpha = 6 \text{ rad/s}^2 \), determine the magnitudes of the velocity and the normal and tangential components of the acceleration of point \( B \) just after the wheel has undergone 2 revolutions. (5 points)

2. For a short time, gear \( A \) of the automobile starter shown in Fig. 2 rotates with an angular acceleration \( \alpha_A = (50\omega^{1/2}) \text{ rad/s}^2 \), where \( \omega \) is in rad/s. Determine the angular velocity of gear \( B \) when \( t = 1 \text{ s} \). When \( t = 0 \), the \( \omega_A(0) = 1 \text{ rad/s} \). The radii of gears \( A \) and \( B \) are 10 mm and 25 mm, respectively. (7 points)

3. Determine the velocity and acceleration of the follower rod \( CD \) (shown in Fig. 3) as a function of \( \theta \) when the contact between the cam and follower is along the straight region \( AB \) on the face of the cam. The cam rotates with a constant counterclockwise angular velocity \( \omega \). (7 points)

4. The epicyclic gear train shown in Fig. 4 consists of the sun gear \( A \) which is in mesh with the planet gear \( B \). This gear has an inner hub \( C \) which is fixed to \( B \) and in mesh with the fixed ring gear \( R \). If the connecting link \( de \) pinned to \( B \) and \( C \) is rotating at \( \omega_{de} = 18 \text{ rad/s} \) about the pin \( e \), determine the angular velocities of the planet and sun gears. (7 points)
5. Determine the velocity of the center $O$ of the spool shown in Fig. 5 when the cable is pulled to the right with velocity $v$. The spool rolls without slipping. (7 points)

![Figure 5: Problem 5](image)

6. If link $CD$ (shown in Fig. 6) has angular velocity $\omega_{CD} = 6 \text{ rad/s}$, determine the velocity of point $B$ on link $BC$ and the angular velocity of the link $AB$ at the instant shown. (9 points)

![Figure 6: Problem 6](image)

7. The wheel shown in Fig. 7 is moving to the right such that it has an angular velocity $\omega = 2 \text{ rad/s}$ and angular acceleration $\alpha = 4 \text{ rad/s}^2$ at the instant shown. If it does not slip against the ground, determine the acceleration of point $B$. (9 points)

![Figure 7: Problem 7](image)

8. Bonus: While the swing bridges shown in Fig. 8 is closing with a constant rotation rate of 0.5 rad/s, a man runs along the roadway such that when $d = 10 \text{ ft}$ he is running outward from the center at 5 ft/s with an acceleration of 2 ft/s$^2$, both measured relative to the roadway. Determine his velocity and acceleration at this instant. (8 points)

![Figure 8: Problem 8](image)