

### Ordinary Gear Trains

The ordinary gear train considered in Fig. 23 has gears with the same module  $m = 24$  mm. Gear 1 has  $N_1 = 22$  teeth, gear 2 has  $N_2 = 18$  teeth, gear 3 has  $N_3 = 20$  teeth, and gear 4 has  $N_4 = 54$  teeth. Gears 3 and 3' are fixed on the same shaft. The gear 1 rotates with an input angular speed  $n_1 = 290$  rpm. The pressure angle of the gears is  $20^\circ$ .

a) Determine whether there will be interference when standard full-depth teeth are used and find the contact ratios of the meshing gears. b) Find the angular velocity of the output gear 4,  $\omega_4$ .

An ordinary gear train is shown in Fig. 25. Gear 1 has  $N_1 = 11$  teeth, gear 2 has  $N_2 = 22$  teeth, gear 2' has  $N_{2'} = 17$  teeth, gear 3 has  $N_3 = 51$  teeth, gear 3' has  $N_{3'} = 12$  teeth, and gear 4 has  $N_4 = 32$  teeth. Gears 2 and 2' are fixed on the same shaft and gears 3 and 3' are fixed on the same shaft. The centers of the gears 1 and 3 are located on the same horizontal axis. Gear 1 rotates with an input angular speed of  $n_1 = 550$  rpm. The diametral pitch of the gears is 4 and the pressure angle of the gears is  $20^\circ$ .

a) Determine whether there will be interference when standard full-depth teeth are used and find the contact ratios of the meshing gears. b) Find the angular velocity of the output gear 4,  $\omega_4$ .

A gear train is shown in Fig. 26. The ring gear 1 has  $N_1 = 60$  teeth, gear 2 has  $N_2 = 25$  teeth, and gear 2' has  $N_{2'} = 15$  teeth. Gears 2 and 2' are fixed on the same shaft. Gear 3 has  $N_3 = 20$  teeth and gears 3 and 3' are fixed on the same shaft. The ring gear 4 has  $N_4 = 90$  teeth. Gear 1 rotates with the input angular speed  $n_1 = 100$  rpm. The diametral pitch of the gears is 5 and the pressure angle of the gears is  $14.5^\circ$ . a) Determine whether there will be interference when full-depth teeth are used and find the contact ratios of the meshing gears. b) Find the angular velocity of the output gear 4,  $\omega_4$ .

A gear train is shown in Fig. 27. Gear 1 has  $N_1 = 11$  teeth, gear 2 has  $N_2 = 19$  teeth, ring gear 4 has  $N_4 = 40$  teeth, gear 5 has  $N_5 = 29$  teeth, and gear 6 has  $N_6 = 24$  teeth. Gear 1 rotates with a constant input angular speed  $n_1 = 200$  rpm. The centers of the gears 1, 4, 5, and 7 are located on the same horizontal axis. The diametral pitch of the gears is 4 and the pressure angle of the gears is  $20^\circ$ . a) Determine whether there will be interference when stub involute teeth are used and find the contact ratios of the meshing

gears. b) Find the angular velocity of the output gear 7,  $\omega_7$ .

A gear train is shown in Fig. 28. Gear 1 has  $N_1 = 28$  teeth, Gear 2 has  $N_2 = 21$  teeth, and gear 4 has  $N_4 = 16$  teeth. Gears 2 and 4 are fixed on the same shaft. The centers of the gears 1 and 5 are located on the same horizontal axis. Gear 1 rotates with the input angular speed  $n_1 = 370$  rpm. The diametral pitch of the gears is 5 and the pressure angle of the gears is  $20^\circ$ . a) Determine whether there will be interference when stub involute teeth are used and find the contact ratios of the meshing gears. b) Find the angular velocity of the output gear 5,  $\omega_5$ .

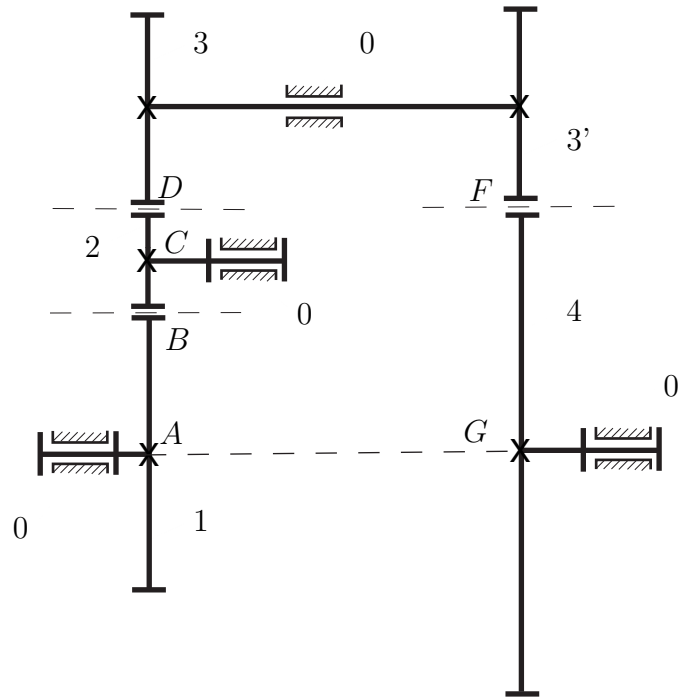


Figure 23

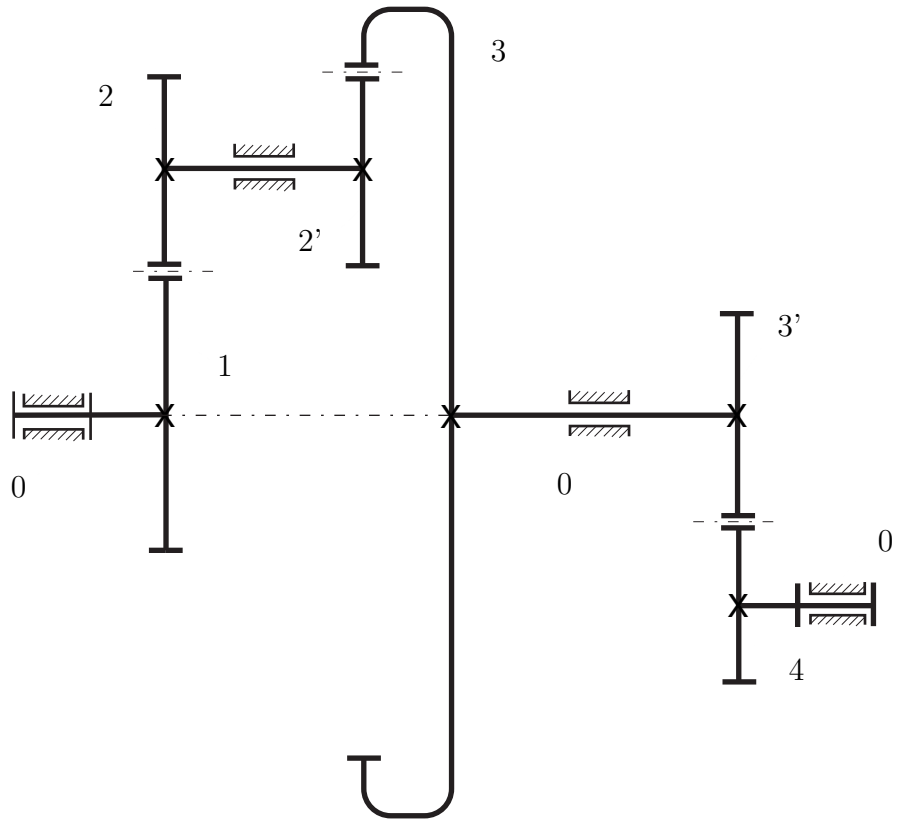


Figure 25

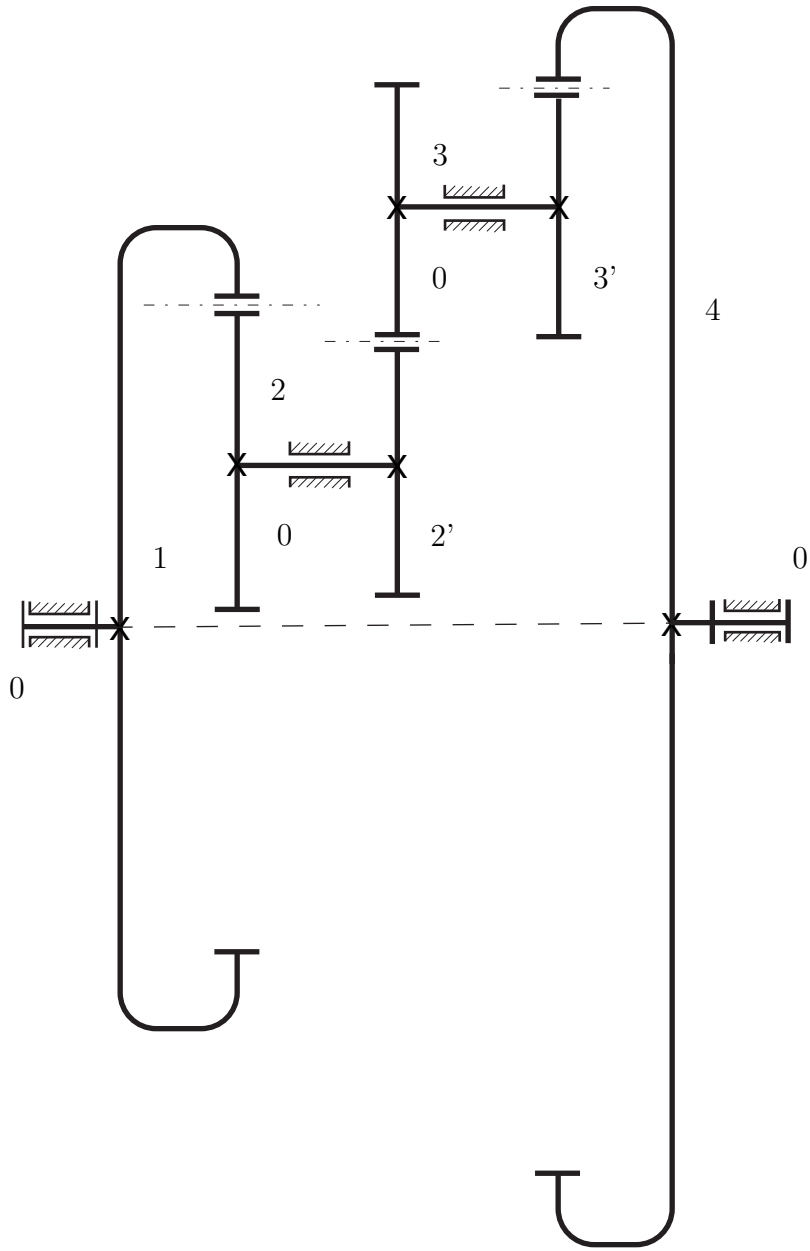


Figure 26

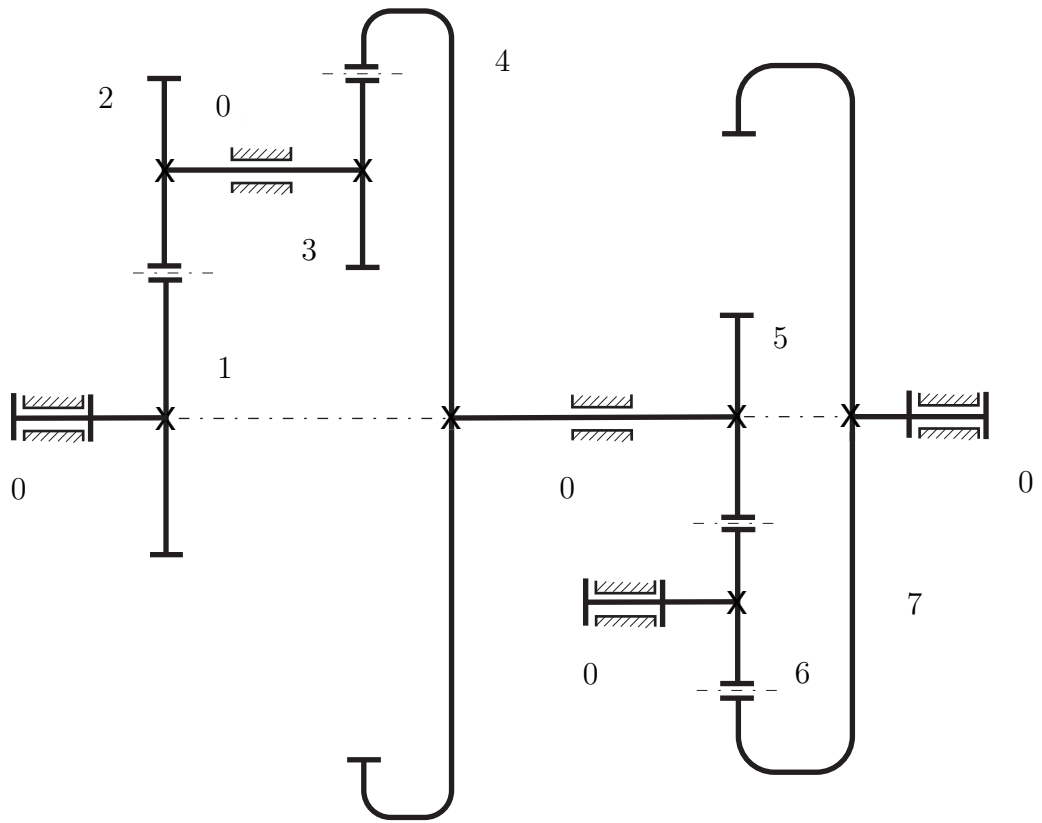


Figure 27

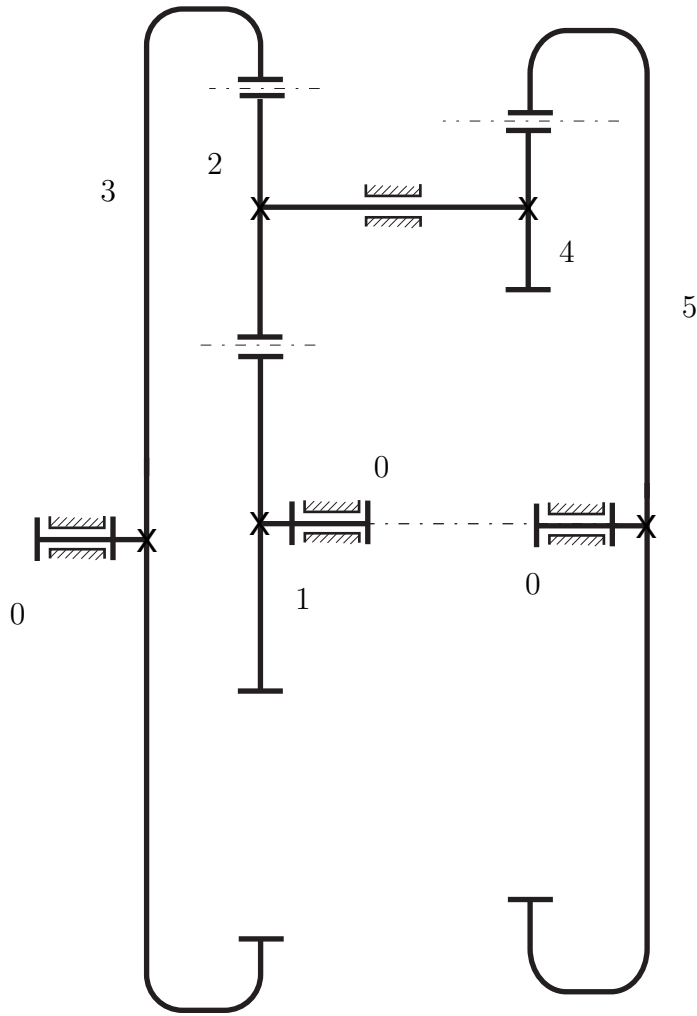


Figure 28