

Assignment #2

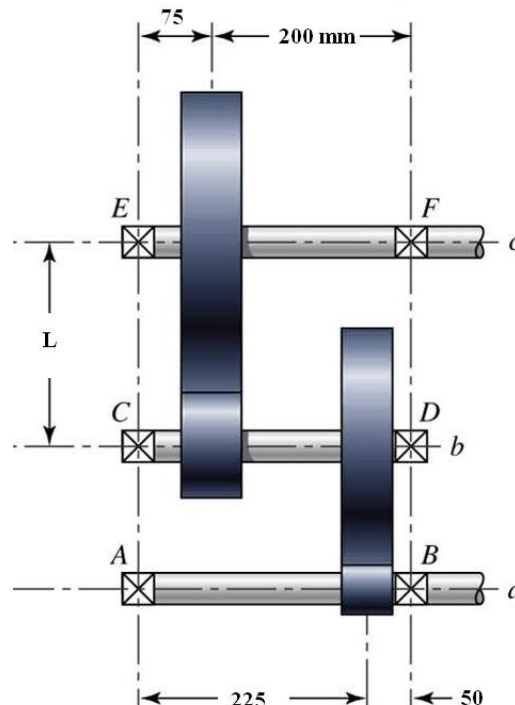
Problem 1:

A 20-tooth pinion (on shaft a) drives the double-reduction spur-gear train in the figure. All gears have modules of 5 mm and 20° pressure angles. The pinion rotates at 1500 rpm and transmits the power to the gear train. The speeds of shafts a, b, c are 1500 rpm, 300 rpm, and 100 rpm respectively.

- Find the number of teeth for the gears on shafts b and c if the center distance between the two shafts $L = 240$ mm.
- Determine for a factor of safety of 1.8 the maximum power that could be transmitted through this gear train.

The material of all gears is grade 1, hardened steel with a Brinell hardness number of 250 HB.

Hint: Use Q6 quality number for the gears in an industrial closed gear unit, for infinite life (10^8 cycles)



Problem 2:

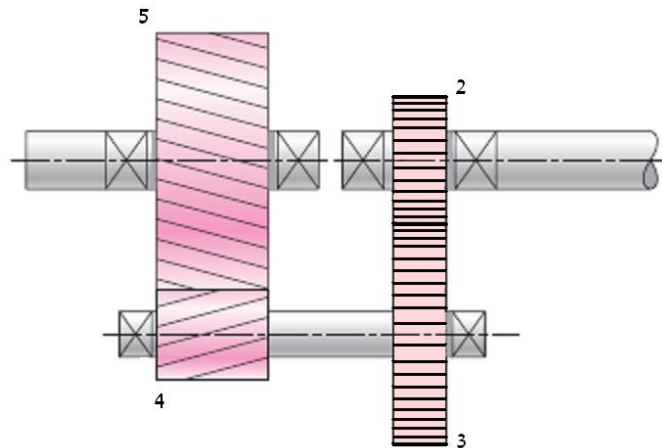
The layout of a two-stage coaxial gear reducer is shown in the figure (the input and output shafts are coaxial). The first stage is a pair of spur gears where the number of teeth of the pinion 2 and gear 3 are 22 and 55 respectively and the module is 4 mm. the second stage is a pair of helical gears.

- a) Select the normal module, the number of teeth and the helix angle for the second stage (gears 4, 5) such that the **total transmission ratio** of the gear train is 7.5

The available standard modules are 3, 3.5, 4, 4.5 and 5 mm.

The normal pressure angle is 20° and the helix angle is required to be between 25° and 30° .

- b) If the input power to this reducer is 5 kW at 1000 rpm, what would be the output torque from this gear box.



Problem 3:

The figure shows a double reduction helical gear set. Pinion 2 is the driver and is rotating at 1800 rpm and transmits 3 kW of power to the system. The number of teeth of gears 2, 3, 4, and 5 are 14, 35, 20, and 50 respectively. The normal module for all gears is 2.5 mm and the normal pressure is 20° . The helix angle of the first stage (gears 2, 3) is 30° and for the second gear set (gears 4, 5) is 25° .

Determine the resultant axial (thrust) force on shaft b from gears 3 and 4.

