

2) What is "Synthesis" and its types?

3). Give the definitions of the following terminology:

a) Idler

b) Module

4) Explain the following definitions BRIEFLY:

a) lower pairs/higher pairs

b) Grashof Criterion

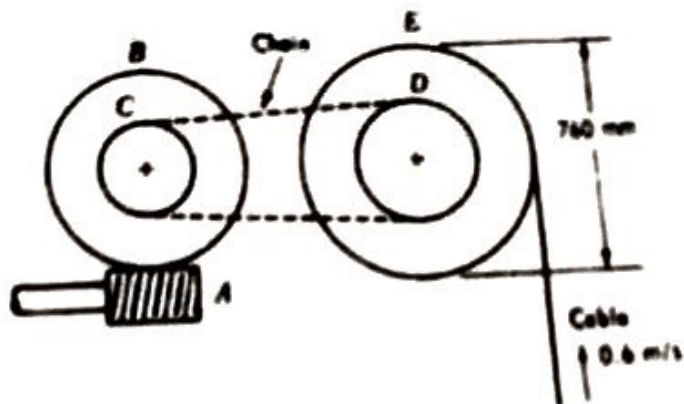
Problem 2: (25")

A pair of 20 degree full-depth involute spur gears with 32 and 80 teeth, diametral pitch of 16 teeth/in, and face width of 0.75 in are to be replaced by helical gears. The same hob used for the spur gears is to be used for the helical gears. The shaft center distance and the angular velocity ratio must remain the same. The helix angle is to be as small as possible, and the overlap is to be 1.6 or greater. Determine the helix angle, the number of teeth, and the face width of the new helical gears.

Problem 3: (25")

Determine the number of teeth on the spur gear D which has a module of 2mm in the figure below if the cable speed is 0.6m/s approximately. The gear B has 60 teeth while the worm A is a left-hand double-threaded rotating at 600 rad/s. The diameter of gear C is 60mm and gear E is 760mm.

- Find:
- Determine the number of teeth on the spur gear D
 - What is the direction of rotation of A when viewed from the right end?



Problem 4: (25")

The gear set shown below consists of three 20° full-depth spur gears with a diametral pitch of 4 and the following tooth numbers: $N_1=20$, $N_2=60$, and $N_3=40$. The unit transmits 10hp with the driveshaft to gear 1 rotating at 800 rev/min counterclockwise. Determine the following: (*Show it on free-body diagram and choose right unit*)

- a) the center distance between gear 1 and 2; gear 2 and 3
- b) the rotational velocity (magnitude and direction) of each gear
- c) the pitch-line velocity
- d) the torque transmitted to each shaft
- e) all forces (magnitude and direction) on each gear

