King Saud University
Department of Mechanical Engineering
ME305 Machine Design
Homework No. (5)
Gears2 Ch.14

Question 1

A 20° full-depth spur pinion has 17 teeth and a module of 1.5 mm and is to transmit 0.25 kW at a speed of 400 rev/min. Find an appropriate face width if the bending stress is not to exceed 75 MPa.

Question 2

A spur pinion is to transmit 15 hp at a speed of 600 rev/min. The pinion is cut on the 20° full-depth system and has a diametral pitch of 5 teeth/in and 16 teeth. Find a suitable face width based on an allowable stress of 10kpsi.

Question 3

A 20° full-depth steel spur pinion rotates at 1145 rev/min. It has a module of 6 mm, a face width of 75 mm, and 16 milled teeth. The ultimate tensile strength at the involute is 900 MPa exhibiting a Brinell hardness of 260. The gear is steel with 30 teeth and has identical material strengths. For a design factor of 1.3 find the power rating of the gear set based on the pinion and the gear resisting bending and wear fatigue.

Question 4

A 20° spur pinion with 20 teeth and a module of 1.5 mm transmits 120 W to a 36-tooth gear. The pinion speed is 100 rev/min, and the gears are grade 1, 18 mm face width, through-hardened steel at 200 Brinell, uncrowned, manufactured to a No. 6 quality standard, and considered to be of open gearing quality installation. Find the AGMA bending and contact stresses and the corresponding factors of safety.

Question 5

A spur gear set has 17 teeth on the pinion and 51 teeth on the gear. The pressure angle is 20° and the overload factor $K_o = 1$. The diametral pitch is 6 teeth/in and the face width is 2 in. The pinion speed is 1120 rev/min and its cycle life is to be 10^8 revolutions at a reliability $R = 0.99$. The quality number is 5. The material is a through-hardened steel, grade 1, with Brinell hardnesses of 232 core and case of both gears. For a design factor of 2, rate the gear set for these conditions using the AGMA method.