Spur Gears Tutorial Sheet B

1. A pair of carbon steel gears is to be designed for strength to transmit 96.5 kW of power with a speed reduction ratio of 4:1. The pinion gear has 24 teeth and rotates at 600 rpm. Given that the pitch of the gear pair is 5 mm, the pressure angle is 20^0, the teeth are full depth and the face width is 85 mm, determine:
   a) The number of teeth on the gear and its speed of rotation;
   b) The pitch line velocity;
   c) The endurance strength of the material suitable for this load.

   [Ans: 96 teeth, 150 rpm; 3.55 ms^{-1}; 404 MPa]

2. A pair of carbon steel gears is to be designed for strength, dynamic tooth load and wear considerations. Given the gear arrangement in Tutorial Q4, that the pinion material has an endurance strength of 105 MPa and an elastic modulus of 208 GPa, and that the gear material has an endurance strength of 95 MPa and an elastic modulus of 200 GPa, determine:
   a) The required face width of the gears taking strength only into account given that
      $2.5 \leq k \leq 4$;
   b) The required face width of the gears taking all considerations into account given that the average hardness of the pinion and the gear is 290 BHN.

   [Ans: 31.42 mm; 37.70 mm]