



(4) → (3)

Design of Three and Four Speed Gear box

First gear ratio,

$$G_1 = \frac{\text{Speed of engine shaft}}{\text{Speed of main shaft}} = \frac{N_A \cdot N_C}{N_B \cdot N_D} = \frac{T_B \cdot T_D}{T_A \cdot T_C}$$

Second gear ratio,

$$G_2 = \frac{\text{Speed of engine shaft}}{\text{Speed of main shaft}} = \frac{N_A \cdot N_E}{N_B \cdot N_F} = \frac{T_B \cdot T_F}{T_A \cdot T_E}$$

Third gear ratio,

$$G_3 = \frac{\text{Speed of engine shaft}}{\text{Speed of main shaft}} = \frac{N_A \cdot N_G}{N_B \cdot N_H} = \frac{T_B \cdot T_H}{T_A \cdot T_G}$$

Fourth gear ratio,

$$G_4 = 1$$

Reverse gear $[N_B = N_C \text{ and } N_{I2} = N_{I1}]$

$$G_1 = \frac{\text{Speed of engine shaft}}{\text{Speed of main shaft}} \\ = \frac{N_A}{N_B} \cdot \frac{N_C}{N_{I2}} \cdot \frac{N_{I1}}{N_D}$$



$$= \frac{T_B}{J_A} \cdot \frac{T_{I_2}}{T_C} \cdot \frac{T_D}{T_{I_1}}$$

Total number of teeth in each pair

$$T_A + T_B = T_C + T_D = T_E + T_F = T_G + T_H = T_I + T_J = \frac{l \times 2}{P}$$

