P8.13 Optimum speeds, feeds, cost, Use Fig. P8.11

A single-tool, single pass turning operation has the following tool life equation: $v^3 f_r^{2.5} T = 15.24 \times 10^6$; $v(m/min), f_r(mm), T(min)$ .The rate for using the machine is $r_m = 0.5/min$, the tool-changing time is $t_{tch} = 5\ min$, and the cost per tool edge is $C_{te} = \$2.50$, $d = 80\ mm$, $L = 400\ mm$

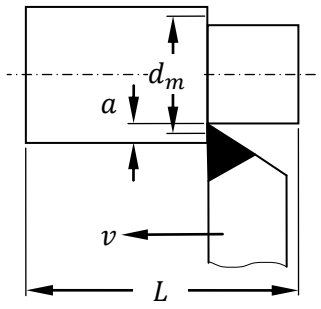

Figure P8.11

(a) The feed f_r is limited by the maximum permissible cutting force of $F_{t,max} = 2516\ N$. If cutting force is determined by $F_t = 1400 b f_r$ and $b = 5\ mm$, what is the maximum feed?

(b) Express the machining time t_m as a function of v and determine the optimum cutting speed $v_{opt}\ (m/min)$.

(c) What is the corresponding machining time t_m and the minimum cost per part C_p?

P8.17 See Fig. P8.17

(a) $d_1 = 80, l_1 = 40,\quad d_2 = 60, l_2 = 80, d_3 = 70, l_3 = 20, d_4 = 55, l_4 = 40,$ all in (mm). Maximum permissible feed on all for tools $f_{max} = 0.3\ mm$, tool life equation for all tools $v^3 f_r^2 T = 2 \times 10^7$, $t_{tch} = 6\ min$, $C_{te} = 4\$$, machine rate $r_m = 0.8\ \$/min$.

Optimize spindle speeds n_a and n_b for minimum $C/part$. Determine n_a, n_b; cutting speeds v_1, v_2, v_3, v_4; Cycle time tool lives T_1, T_2, T_3, T_4, and cost per part C_p for the optimum conditions.

(b) $d_1 = 100, l_1 = 50,\quad d_2 = 55, l_2 = 88, d_3 = 110, l_3 = 47, d_4 = 50, l_4 = 95,$ all in (mm). Maximum permissible feed on tools 1 and 3 is $0.25\ mm$ and on tools 2 and 4 $0.3\ mm$, tool life equation is the same for all four tools $v^4 f_r^2 T = 3.24 \times 10^8$, $t_{tch} = 7.5\ min$, $C_{te} = 8\$$, machine rate $= \$1.25$. Determine optimum spindle speeds, cutting speeds, tool lives, and optimum cost per part.

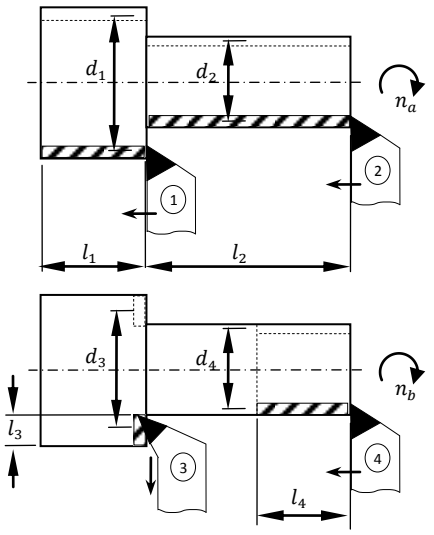

Figure P8.17