3)

a) Design Variables → d, t

Objective

Min : $C_1 w + C_2 d$

$C_1 = 4 \quad C_2 = 2$

$4w + 2d$

$$w = \frac{0.0025 \times \pi \times 275}{4} \left[(d^2 + 2t)^2 - d^2 \right]$$

Useful 'H', 'E', 'I', 'P', 'Yield Stress'

Constraints

① $d > d_1 = 1 \Rightarrow d > 1 \Rightarrow -d + 1 \leq 0$

② $d < d_2 = 10 \Rightarrow d - 10 \leq 0$

③ $t > t_1 \Rightarrow -t + 0.1 \leq 0$

④ $t < 1 \Rightarrow t - 1 \leq 0$

⑤ $\sigma < \sigma_b \Rightarrow \frac{P}{\pi dt} - \frac{\pi E I}{H^2 dt} \leq 0$

$$\frac{P}{\pi dt} - \frac{\pi^2 \times E}{8 H^2} (d^2 + t^2) \leq 0$$

⑥ $\sigma <$ Yield Stress.

$\sigma -$ Yield Stress ≤ 0

b) Constraints

$-d + 1 \leq 0$

$d - 10 \leq 0$

$-t + 0.1 \leq 0$

$t - 1 \leq 0$

$$\frac{2000}{\pi dt} - \frac{\pi^2 \times 9 \times 10^5 \times (d^2 + t^2)}{8 \times (275)^2} \leq 0$$

$$\frac{2000}{\pi dt} - 550 \leq 0.$$

Min

$$4\left(\frac{0.0025 \times \pi \times 275}{4}\left[(d+2)^2 - d^2\right]\right.$$

The d, t values are:

6.117589
0.189207

c) Please check the matlab files in q3 folder

mainscript-→ Run

confun-→ function for non- linear inequality

objecfun-→ function for linear inequality

x = 3.4269 0.9938

fval = 44.8104

d) Please check the same files again

x2=6.1176 0.1892

fval2 =22.5445

(e) Yes results agree except for Active-Set

After changing initial values to 5 and 0.9

Excel does not change answer

6.117589
0.189207

Active set becomes better

x3 =6.1176 0.1892

fval3 = 22.5445

SQP remains same

x4 =6.1176 0.1892

fval4 =22.5445