16MI3102
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Algorithm chart
LAB - 2

step 1: start

step 2: Define a function to calculate wp f(wp)

$A_1 wp^3 + A_2 wp^2 + A_3 wp + A_4$;

step 3: Define a function which return derivatives of function wp : df(wp) :

$3 A_1 wp^2 + 2 A_2 wp + A_3$

step 4: Find A_1, A_2, A_3, A_4 using formulae.

$$A_1 = \frac{0.3651}{sp}$$

$$A_2 = 0.64 \cdot S1 \cdot \rho D fos$$

$$A_3 = -2 \rho D fos wy$$

$$A_4 = -fos \rho D wy^2$$

step 5: calculated $S1 = K (1000)^{-a}$

$$\ln K = \frac{\left(\sum_{i=1}^{4} y_i\right)\left(\sum_{i=1}^{4} x_i^2\right) - \left(\sum_{i=1}^{4} x_i\right)\left(\sum_{i=1}^{4} x_i y_i\right)}{4\left(\sum_{i=1}^{4} x_i^2\right) - \left(\sum_{i=1}^{4} x_i\right)^2}$$

$$-a = \frac{4\left(\sum_{i=1}^{4} x_i y_i\right) - \left(\sum_{i=1}^{4} x_i\right)\left(\sum_{i=1}^{4} y_i\right)}{4\left(\sum_{i=1}^{4} x_i^2\right) - \left(\sum_{i=1}^{4} x_i^2\right)}$$

step 6: take wp = 100, error = 0.01

step 7: calculate $wp = wp - \frac{f_1(wp)}{f_2(wp)}$

step8: If $|wp_1 - wp| \leq e$, go to step 10.

step9: Else, $wp = wp_1$ and go to step 6.

step 10: Display wp_1 as the final answer

step11: stop.

...pe functions:

...wp(var[], wp):

for i = 1 → 4:

$fx = var[i] \times pow(wp, 3-i)$

return fx

dfwp (var[], wp):

return 3 x var[0] * pow(wp,2) + 2 * var[1] * wp +

...onditions for Mining coal

...lculation of A_1, A_2, A_3, A_4:

$G(wp) = A_1\, wp^3 + A_2\, wp^2 + A_3\, wp + A_4 = 0$

$$FOS = \frac{SP}{\sigma P} : \frac{\text{Rock / coal strength}}{\text{Applied / insitu stress}}$$

$$FOS = \frac{S_1\left(0.64 + 0.36\frac{wp}{hp}\right)}{\rho D} \times \frac{wp^2}{(wp + wg)^2}$$

$$\left[\frac{S_1 0.64}{\rho D} + \frac{0.36 S_1 \frac{wp}{hp}}{\rho D}\right]\frac{wp^2}{(wp+wg)^2} - FOS = 0$$

$$wp^2[S_1 \times 0.64] + wp^3\left[0.36\frac{S_1}{hp}\right] - \rho D FOS (wp + wg)^2 = 0$$

$$wp^2[S_1 \times 0.64] + wp^3\left[\frac{0.36 S_1}{hp}\right] - \rho D FOS\left[wp^2 + wg^2 + 2wpwg\right] = 0$$

$$\cancel{\rho D FOS}$$

$$wp^2[S_1 \times 0.64 - \rho D FOS] + wp^3\left[\frac{0.36S_1}{hp}\right] - [\rho D FOS \times 2wg]wp - [wg^2 \rho D FOS] = 0$$

$$A_1 = \frac{0.36S_1}{hp}$$

$$A_2 = 0.64 S_1 - \rho D FOS$$

$$A_3 = -2\rho D FOS\, wg$$

$$A_4 = -FOS \rho D\, wg^2$$

A_1, A_2, A_3, A_4 for Newton Rapson Approximation.