1ª Tarefa de Métodos Numéricos I – Teoria de Erros

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Questão 1:

a) 27/2 = 13 resto: 1
13/2 = 6 resto: 1
6/2 = 3 resto: 0
3/2 = 1 resto: 1
1/2 = 0 resto 1

27 (base 10) = 11011 (base 2)

b)
Método Comum:
1 1 0 1 1
$(1 * 2^4) + (1 * 2^3) + (0 * 2^2) + (1 * 2^1) + (1*2^0) = 27$

Parênteses encaixados:
1 1 0 1 1
2*(2*(2*(2*1 + 1) + 0) +1) +1 = 27

c) Arquivo no ZIP

Questão 2:

a) $m = 0{,}1000 \times 10^{-5} = 10^{-6}$

$M = 0{,}9999 \times 10^5 = 99990$

b) Não, pois o maior número representável é menor que 100.000.

c) $357{,}3 = 0{,}3573 \times 10^3$

d) $357{,}2 = 0{,}3572 \times 10^2$

e) $E_A = |\, 357{,}3 - 357{,}2 \,| = 0{,}1 = 0{,}0001 \times 10^3$
$E_R = 0{,}0001/0{,}3572 = 0{,}0003$ usando arredondamento | 0,0002 usando truncamento.

Questão 3:

a) $f_x = 0,3572$, $g_x = 0,6$, X

b) $E_A = | 0,35726 – 0,3572 | \times 10^3$
$E_A = 0,6 \times 10^{-1} = 0,0006 \times 10^2 < 10^{-1}$
$E_R = (0,6 \times 10^{-1} / 0,3572 \times 10^3) < (10^{-1} / 0,1 \times 10^3) = 10^{-3}$

c) $X_{barra} = 0,3572 \times 10^3 + 10^{-1}$, pois $g_x = 0,6 >= ½$

$E_A = | 0,35726 – 0,3573 | \times 10^3$
$E_A = 0,4 \times 10^{-1} <= 1/2 \times 10^{-1}$

$E_R = (0,4 \times 10^{-1} / (0,3573 \times 10^3)) < 1/2 \times 10^{-3}$

Questão 4:

a) u = (m+n) * w / o

$Er = ½ \times 10^{-t+1}$

$|RA| < ½ \times 10^{-t+1}$

z = m+n

$Er_z = Er_m (m / m+n) \times Er_n (n / m+n) + RA$

$Er_z = ½ \times 10^{-t+1} (m+n / m+n) + RA$

$Er_z = ½ \times 10^{-t+1} + |RA| < 10^{-t+1}$

x = z * w

$Er_x = Er_z + Er_w$

$Er_x = ½ \times 10^{-t+1} + RA_z + ½ \times 10^{-t+1} + RA_x$

$Er_x = 10^{-t+1} + |RA_z| + |RA_x| < 10^{-t+1} + ½ \times 10^{-t+1} + ½ \times 10^{-t+1} = 2 \times 10^{-t+1}$

j = x / o

$Er_j = Er_x – Er_o$

$Er_j = 10^{-t+1} + RA_z + RA_x - ½ \times 10^{-t+1} + RA_j$

$Er_j = ½ \times 10^{-t+1} + |RA_z| + |RA_x| + |RA_j| < 2 \times 10^{-t+1}$

b) $u = (m+n) * w / o$

$E_r = 0$

$|RT| < 10^{-t+1}$

$z = m+n$

$Er_z = Er_m\ (m / m+n) * Er_n\ (n / m+n) + RT$

$Er_z = 0 * (m+n / m+n) + RT$

$Er_z = |RT| < 10^{-t+1}$

$x = z * w$

$Er_x = Er_z + Er_w$

$Er_x = 0 + RT_z + 0 + RT_x$

$Er_x = |RT_z| + |RT_x| < 10^{-t+1} + 10^{-t+1} = 2 \times 10^{-t+1}$

$j = x / o$

$Er_j = Er_x – Er_o$

$Er_j = 0 + RT_z + RT_x - 0 + RT_j$

$Er_j = |RT_z| + |RT_x| + |RT_j| < 3 \times 10^{-t+1}$

c)

1)

m/ = 10; n/ = 20; w/ = 30; o/ = 40;

$u = (m+n) * w / o$

$E_r = ½ \times 10^{-t+1}$

$|RA| < ½ \times 10^{-t+1}$

$z = m+n$

$Er_z = Er_m\ (\ 10 / 10 +20) \times Er_n\ (20 / 10+20) + RA$

$Er_z = ½ \times 10^{-t+1}\ (10+20 / 10+20) + RA$

$Er_z = ½ \times 10^{-t+1} + |RA| < 10^{-t+1}$

$x = z * w$

$Er_x = Er_z + Er_w$

$Er_x = \frac{1}{2} \times 10^{-t+1} + RA_z + \frac{1}{2} \times 10^{-t+1} + RA_x$

$Er_x = 10^{-t+1} + |RA_z| + |RA_x| < 10^{-t+1} + \frac{1}{2} \times 10^{-t+1} + \frac{1}{2} \times 10^{-t+1} = 2 \times 10^{-t+1}$

$j = x / o$

$Er_j = Er_x - Er_o$

$Er_j = 10^{-t+1} + RA_z + RA_x - \frac{1}{2} \times 10^{-t+1} + RA_j$

$Er_j = \frac{1}{2} \times 10^{-t+1} + |RA_z| + |RA_x| + |RA_j| < 2 \times 10^{-t+1}$

2)

$m = 10; n = 20; w = 30; o = 40;$

$u = (m+n) * w / o$

$E_r = 0$

$|RT| < 10^{-t+1}$

$z = m+n$

$Er_z = Er_m (10 / 10+20) * Er_n (20 / 10+20) + RT$

$Er_z = 0 * (10+20 / 10+20) + RT$

$Er_z = |RT| < 10^{-t+1}$

$x = z * w$

$Er_x = Er_z + Er_w$

$Er_x = 0 + RT_z + 0 + RT_x$

$Er_x = |RT_z| + |RT_x| < 10^{-t+1} + 10^{-t+1} = 2 \times 10^{-t+1}$

$j = x / o$

$Er_j = Er_x - Er_o$

$Er_j = 0 + RT_z + RT_x - 0 + RT_j$

$Er_j = |RT_z| + |RT_x| + |RT_j| < 3 \times 10^{-t+1}$