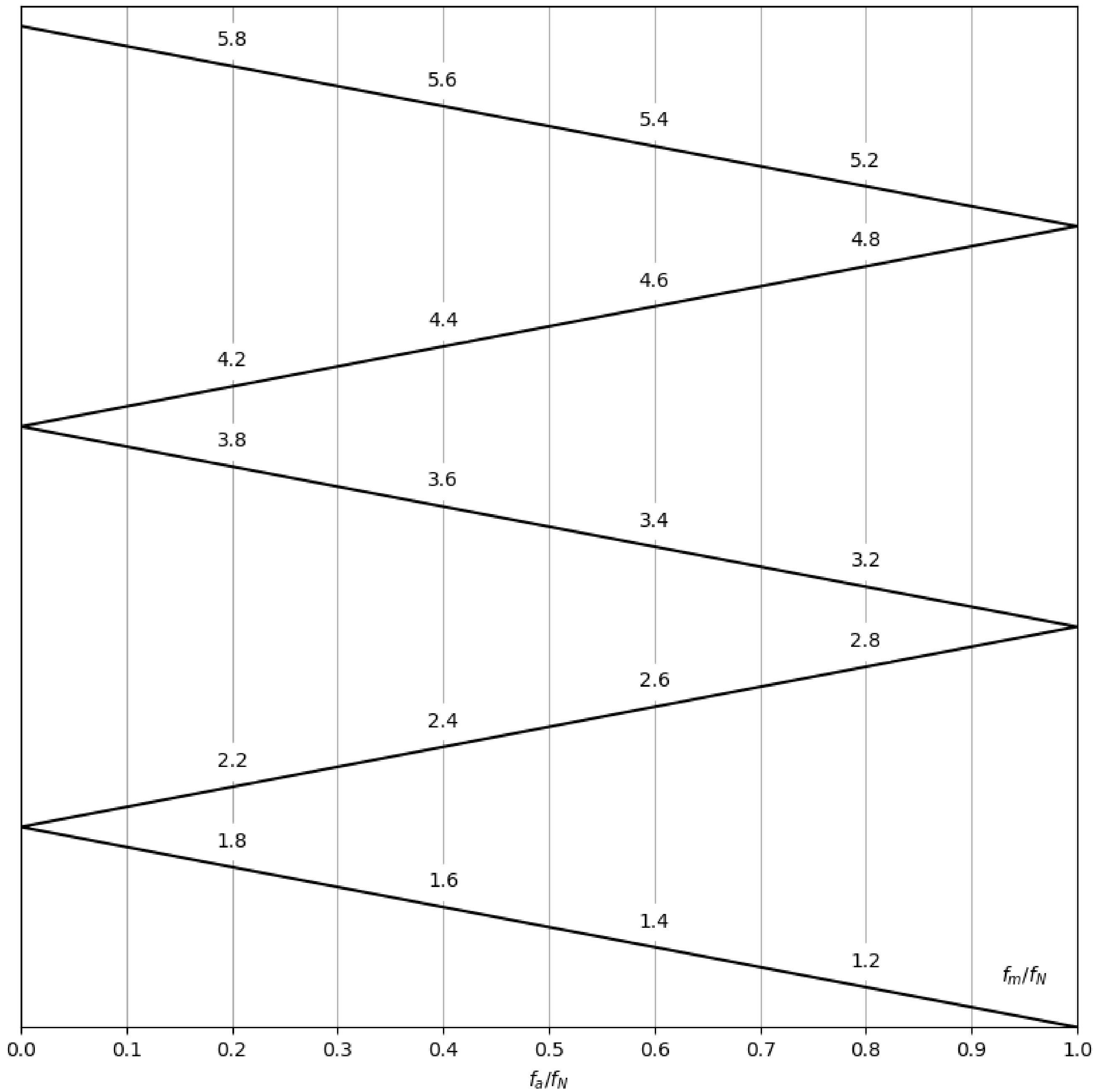
ELET 270 Instrumentation
Exam 2 Formula Sheet
Please do not write on sheet

$$N = \sum_{i=0}^{n-1} d_i b^i$$
$$e = x_i - x_t$$
$$e_s = x_{avg} - x_t$$
$$e_r = |x_i - x_{avg}|$$
$$s = \frac{d(output)}{d(input)} = \frac{\Delta output}{\Delta input}$$
$$V_2 = aR\frac{5V}{1023}$$
$$V_2 = V_s\frac{R_2}{R_t+R_2}$$
$$R_t = R_2\left(\frac{5V}{V_2} - 1\right)$$
$$T = \frac{B}{ln\left(\frac{R}{R_1}e^{\frac{B}{T_1}}\right)}$$
$$B = \left(A'A\right)^{-1} A'Y$$

$$q = hA\left(T_{mouth} - T_{blub}\right) = mc\frac{dT}{dt}$$
$$T_{mouth} - T_{blub} = \frac{mc}{hA}\frac{dT}{dt}$$
$$\tau = \frac{mc}{hA}$$
$$\frac{x(t)-x_{ss}}{x_0-x_{ss}} = e^{\frac{-t}{\tau}}$$
$$\tau\dot{x}\left(t\right) + x\left(t\right) = x_{ss}\Phi\left(t\right)$$
$$\tau = \frac{x_{ss}-x_0}{\dot{x}(0)}$$
$$\bar{x} = \frac{x_1+x_2+\cdots+x_n}{n} = \sum_{i=1}^{n}\frac{x_i}{n}$$
$$\mu = \sum_{i=1}^{N}\frac{x_i}{N}$$
$$d_i = x_i - \bar{x}$$
$$S = \sqrt{\sum_{i=1}^{n}\frac{\left(x_i-\bar{x}\right)^2}{n-1}}$$
$$\sigma = \sqrt{\sum_{i=1}^{N}\frac{\left(x_i-\mu\right)^2}{N}}$$
$$P\left(A\ or\ B\right) = P\left(A\right) + P\left(B\right)$$
$$P\left(AB\right) = P\left(A\right)\cdot P\left(B\right)$$
$$P\left(A\cup B\right) =$$
$$P\left(A\right) + P\left(B\right) - P\left(A\right)\cdot P\left(B\right)$$
$$\sum_{i=1}^{n} P\left(x_i\right) = 1$$

$$\mu = \sum_{i=1}^{N} x_i P\left(x_i\right)$$
$$P\left(a \le x \le b\right) = \int_a^b f\left(x\right)dx$$
$$\mu = \int_{-\infty}^{\infty} x f\left(x\right)dx$$
$$f\left(x\right) = \frac{1}{\sigma\sqrt{2\pi}}e^{\frac{-(x-\mu)^2}{2\sigma^2}}$$
$$\nu = n - 1$$
$$f\left(t,\nu\right) = \frac{\Gamma\left(\frac{\nu+1}{2}\right)}{\sqrt{\nu\mu}\Gamma\left(\frac{\nu}{2}\right)\left(1+\frac{t^2}{\nu}\right)^{\frac{\nu+1}{2}}}$$
$$\Gamma\left(n\right) = \left(n-1\right)!$$
$$y = kx^m$$
$$m = \frac{\log\left(y_2\right)-\log\left(y_1\right)}{\log\left(x_2\right)-\log\left(x_1\right)}$$
$$R = \frac{80}{\sqrt{L}}$$
$$L = \frac{6400}{R^2}$$
$$z = \frac{\bar{x}-\mu}{\sigma}$$
$$u_Y = \sqrt{\sum_{i=1}^{n}\left(u_{x_i}\frac{\partial Y}{\partial x_i}\right)^2}$$
$$P_{cr} = \frac{4\pi^2 EI}{L^2}$$
$$I = \frac{1}{12}b^4$$
$$\frac{\partial f}{\partial x} \approx \frac{\Im[f(x+ih)]}{h}$$
$$\dot{m} = CA\sqrt{\frac{2P_1}{RT_1}\Delta P}$$
$$V = mG + b$$
$$V = \left(3.125\times 10^{-3}\right)G + 2.5$$
$$\mu = \bar{x} \pm \delta$$
$$\bar{x} - \delta \le \mu \le \bar{x} + \delta$$
$$C.L. = P\left(\bar{x} - \delta \le \mu \le \bar{x} + \delta\right)$$
$$C.L. = 1 - \alpha$$
$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$$
$$z = \frac{\bar{x}-\mu}{\sigma_{\bar{x}}}$$
$$z = \frac{\bar{x}-\mu}{S/\sqrt{n}}$$
$$\mu = \bar{x} \pm z_{\frac{\alpha}{2}}\frac{S}{\sqrt{n}}$$
$$A = \frac{C.L.}{2}$$
$$z_{\frac{\alpha}{2}} = z_1 + z_2$$

$$t = \frac{\bar{x}-\mu}{S/\sqrt{n}}$$
$$\mu = \bar{x} \pm t_{\frac{\alpha}{2}}\frac{S}{\sqrt{n}}$$
$$A = \frac{1-C.L.}{2}$$
$$P_{\bar{x}} = \pm t\frac{S_x}{\sqrt{n}}$$
$$\bar{x}_{final} = \sum_{i=1}^{M}\frac{x_i}{M}$$
$$P_{\bar{x}_{final}} = \pm t\frac{S_x}{\sqrt{M}}$$
$$P_{\bar{x}_{final}} = \pm t S_x$$
$$u_x = \sqrt{B_x^2 + P_x^2}$$
$$u_{\bar{x}} = \sqrt{B_x^2 + P_{\bar{x}}^2}$$
$$f_s > 2f_m$$
$$f_N = \frac{f_s}{2}$$
$$D_o = int\left[\frac{V_i - V_{rl}}{V_{ru} - V_{rl}}\left(2^N - 1\right)\right]$$
$$V_i = D_o\left(\frac{V_{ru}-V_{rl}}{2^N-1}\right) + V_{rl}$$
$$R_e = \pm 0.5\frac{V_{ru}-V_{rl}}{2^N-1}$$
$$\epsilon = \frac{\frac{\Delta R}{R_o}}{GF}$$
$$\sigma = E\epsilon$$
$$I_{ABC} = \frac{V_s}{R_1+R_4}$$
$$I_{ADC} = \frac{V_s}{R_p+R_g}$$
$$V_B = \frac{V_s R_4}{R_1+R_4}$$
$$V_D = \frac{V_s R_g}{R_p+R_g}$$
$$V_o = V_s\frac{R_1R_g - R_4R_p}{(R_p+R_g)(R_1+R_4)}$$
$$V_o = V_s\frac{R_1(R_o+\Delta R_g) - R_4R_p}{(R_p+(R_o+\Delta R_g))(R_1+R_4)}$$
$$\Delta R_g =$$
$$\frac{V_s(R_1R_o - R_4R_p) - V_o(R_1+R_4)(R_p+R_o)}{V_o(R_1+R_4) - V_sR_1}$$
$$V_o = V_{in}\left(1 + \frac{R_2}{R_1}\right)$$
$$gain = \left(1 + \frac{R_2}{R_1}\right)$$


5.8
5.6
5.4
5.2
4.8
4.6
4.4
4.2
3.8
3.6
3.4
3.2
2.8
2.6
2.4
2.2
1.8
1.6
1.4
1.2
f_m/f_N
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1.0
f_a/f_N