a. $Q = 35$

b. $\zeta = \frac{1}{2Q} = \frac{1}{70} = 0.0143$

c. $f_n = 2.5\ KHz$

d. $m = 100\mu g = (100\times10^{-6})(1\times10^{-3}) = 1\times10^{-7}\ Kg$

$\omega_n = 2\pi f_n$

$\omega_n^2 = \frac{K}{m}$

$K = m\omega_n^2 = m(2\pi f_n)^2 = 1\times10^{-7}(2\pi(2500))^2 = 24.67\ N/m$

e. $\frac{c}{m} = \frac{\omega_n}{Q}$

$c = \frac{m\omega_n}{Q} = \frac{m 2\pi f_n}{Q} = \frac{(1\times10^{-7})2\pi(2500)}{35} = 4.49\times10^{-5}\ kg/s$

f. input amplitude $= 0.2\mu m$

output amplitude $=$ (input amplitude)$\left|T(j\omega)\right|_{\omega_N}$

$=$ (input amplitude) Q

$= (0.2\mu m)(35)$

$= 7\mu m$

g. if $x(t) = X_0 \sin(\omega t) \rightarrow$ displacement

$\dot{x}(t) = X_0\omega\cos(\omega t) \rightarrow$ velocity

$\ddot{x}(t) = -X_0\omega^2\sin(\omega t) \rightarrow$ acceleration

$\ddot{y}(t)\Big|_{\omega=\omega_n} = Q\ddot{x}(t)$

$\ddot{y}(t)\Big|_{max} = QX_0\omega_n^2 = 35(2\times10^{-7})(2\pi 2500)^2 = 1727\ m/s^2$

$\ddot{y}(t)\Big|_{max} = \frac{1727}{9.8} = 176\ G's$

h. $\frac{\omega_n}{Q} = \frac{2\pi f_n}{Q} = \frac{2\pi(2500)}{35} = 448.8\ s^{-1}$

$\omega_n^2 = (2\pi f_n)^2 = (2\pi 2500)^2 = 2.47\times10^8\ s^{-2}$

$$T(s) = \frac{\frac{\omega_n}{Q}s + \omega_n^2}{s^2 + \frac{\omega_n}{Q}s + \omega_n^2} = \frac{448.8s + 2.47\times10^8}{s^2 + 448.8s + 2.47\times10^8}$$

Sample M-file:

```
%Transmissibility M-file for HW #3
clear all;
format compact;
format long;

Q=35
fn=2500

for i=1:5000,
    f(i)=i;
    T(i)=sqrt((1+(i/(Q*fn))^2)/((1-(i/fn)^2)^2+(i/(Q*fn))^2));
end

plot(f,T)
```