Table of Contents

MAE 6258 HW 4

```
%Randy Schur
%2/11/15
clear
close
%Problem 1a
F= 13;
w = 20;
m= 75;
k= 2500;
wn = sqrt(k/m);

d_st = F/k;
Xmax = .002;
wa = w;
p=wa/wn;
r=w/wn;
ma = F/(Xmax*wa^2);
ka = wa^2*ma;

%b
mu = ma/m;
fn1 = @(r1) abs(p^2-r1.^2)./abs((1-r1.^2).*(p^2-r1.^2)-mu*p^2*r1.^2) - 1;
rhat1 = fsolve(fn1, 1);
rhat2 = fsolve(fn1, 5);
range_1 = rhat1*wn*60/(2*pi)
range_2 = rhat2*wn*60/(2*pi)
```

Equation solved.

fsolve completed because the vector of function values is near zero as measured by the default value of the function tolerance, and the problem appears regular as measured by the gradient.

Equation solved.

fsolve completed because the vector of function values is near zero as measured by the default value of the function tolerance, and the problem appears regular as measured by the gradient.

Problem 2

```
clear
close
wn = 1750*2*pi/60;
ma = 5;
r_a = @(mu) (mu+2-sqrt((mu+2)^2-4))/2 - (1400/1750)^2;
r_b = @(mu) (mu+2+sqrt((mu+2)^2-4))/2 - (2190/1750)^2;
mu1 = fzero(r_a, 2);
mu2 = fzero(r_b, 2);
mu_avg = (mu1+mu2)/2;
m_eff = ma/mu_avg;

r1 = 1000/1750;
r2 = 2000/1750;
A = sqrt(10);
phi1 = (-1/A+r1^2-1)^(-1);
phi2 = (1/A+r2^2-1)^(-1);
p_sq = r1^2*r2^2*(phi2-phi1)/(r2^2*phi2 - r1^2*phi1);
mu =(r2^2 - r1^2)/(r1^2*r2^2*(phi2  -phi1));

wa = sqrt(p_sq)*wn
ma = mu*m_eff
%b
k1 = wn^2*m_eff;
r = logspace( -1, 1, 1000);
w = r*1750;
X_1 = 1./abs(1 - r.^2);
X_2 = abs(p_sq - r.^2)./abs((1-r.^2).*(p_sq-r.^2)-mu*p_sq.*r.^2);
semilogx(w, 20*log10(X_1), w, 20*log10(X_2), w, repmat(10, [1 1000]))
x = linspace(-40, 60, 100);
y1 = repmat(1000, size(x));
y2 = repmat(2000, size(x));

hold on
semilogx(y1, x, 'k:', y2, x, 'k:')
title('System Frequency Response')
xlabel('RPM')
ylabel('Amplitude (dB)')
legend('No DVA', 'With DVA')
```
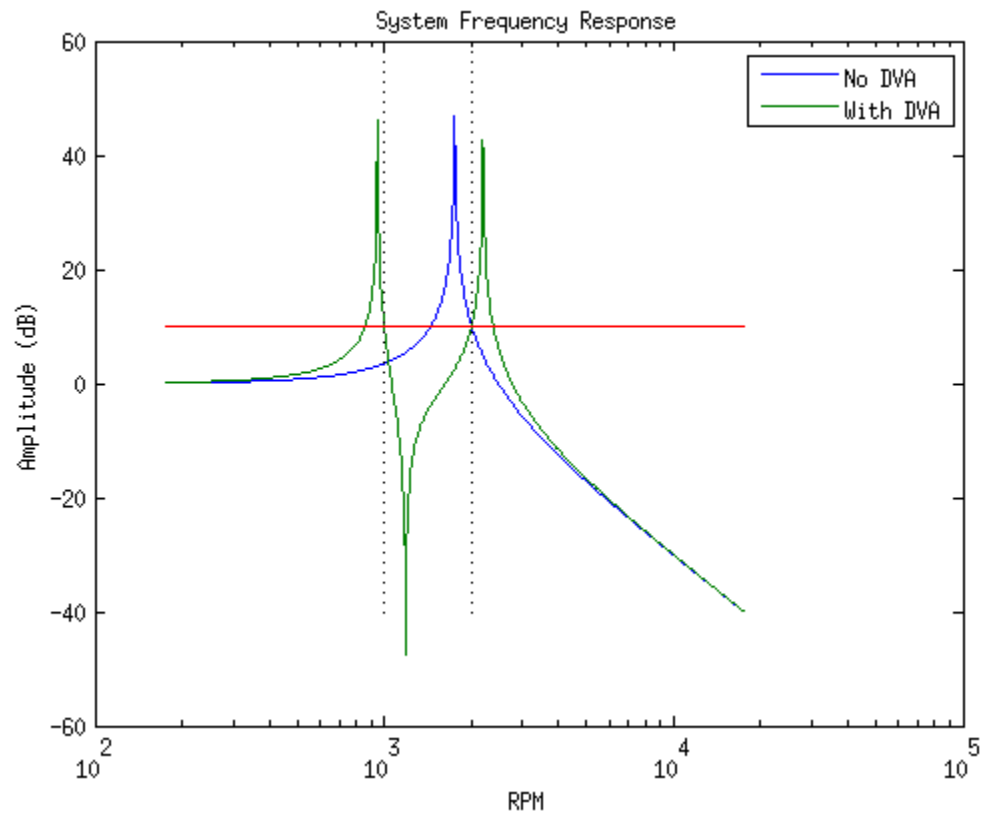
wa =

    124.2398

ma =

    21.5567

System Frequency Response

Problem 4

```
k1 = 40000;
m=1000;
Ft = 100;
F = 70;
gamma = .5*(Ft/F - 1);
zeta = sqrt(2*(1+2*gamma)/gamma)/(4*(1+gamma));
c = zeta*2*sqrt(m*k1)
k2 = k1/gamma
```


   c =

    9.5093e+03

```
k2 =

   1.8667e+05
```

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