Vibrations and Waves
Errors & Corrections Sheet
Last updated: 17 February 2005

Handout Sheet for Lecture 2:

In DERIVATION 2.3: **Anharmonic SHM**

Original:

$$-s_2\left[A_1^2\exp(j2\omega_0 t)+A_1A_2\exp(j3\omega_0 t)+...\right]$$

Should read:

$$-s_2\left[A_1^2\exp(j2\omega_0 t)+2A_1A_2\exp(j3\omega_0 t)+...\right]$$

Handout Sheet for Lecture 8:

Should have copy with *CORRECTED VERSION* at top.

Handout Sheet for Lecture 10:

In DERIVATION 10.4: **GroupVelocity**

Original:

$$v_g = \frac{d\omega}{dk} = \frac{d}{dk}(kv) = v + k\frac{dv}{dk} = v - \lambda\frac{dv}{d\lambda}v_g$$

Should read:

$$v_g = \frac{d\omega}{dk} = \frac{d}{dk}(kv) = v + k\frac{dv}{dk} = v - \lambda\frac{dv}{d\lambda}$$

Handout Sheet for Lecture 12:

DERIVATION 12.2: **Young's Slits**

Original:

****Slit separation s, distance to screen a,***

Should read:

****Slit separation a, distance to screen s,***

Classwork 2

Question Sheet:

(viii) Calculate ω_r ……

Answer Sheet:

viii)

$$\omega_r = \sqrt{\omega_0^2 - \frac{r^2}{2M^2}} = \sqrt{37.64^2 - \frac{5630^2}{2\times 95^2}}$$

$$= 41.91 rad/s$$

Wrong => I miscalculated this when I wrote the answer sheet. You cannot calculate ω_r in this system.

Why??? The system is so close to critical (see part (ix) in Classwork 2) that $\left(\omega_0^2 - \frac{r^2}{2M^2}\right) < 0$ but $\left(\omega_0^2 - \frac{r^2}{4M^2}\right) > 0$. Therefore, ω_r cannot be calculated and is meaningless.

Remember, we work out ω_r from when the amplitude x_0 of forced SHM is a maximum. However, close to critical the peak in the curve disappears! Hence you can't calculate a value of ω_r.

Homework 1

Answer Sheet:

I left out the factor of 2 in the 4th line in front of A_1A_2 – same mistake is noted above in Handout 2

Solve:

$$-m\omega_0^2 A_1 \exp(j\omega_0 t) - m4\omega_0^2 A_2 \exp(j2\omega_0 t)$$
$$-m9\omega_0^2 A_3 \exp(j3\omega_0 t)....$$
$$= -50\left[A_1 \exp(j\omega_0 t) + A_2 \exp(j2\omega_0 t) + A_3 \exp(j3\omega_0 t) + ...\right]$$
$$-3\left[A_1^2 \exp(j2\omega_0 t) + 2A_1 A_2 \exp(j3\omega_0 t) + ...\right]$$
$$-0.06\left[A_1^3 \exp(j3\omega_0 t) + ...\right]$$

Hence answer is different for:

3rd Harmonic:

$$m9\omega_0^2 A_3 = 50A_3 + 6A_1A_2 + 0.06A_1^3$$

$$\Rightarrow 9\frac{50}{m}A_3 = \frac{50}{m}A_3 + \frac{6}{m}A_1A_2 + \frac{0.06}{m}A_1^3$$

$$\Rightarrow 8\frac{50}{m}A_3 = \frac{6}{m}A_1A_2 + \frac{0.06}{m}A_1^3$$

$$\Rightarrow A_3 = \frac{6A_1A_2 + 0.06A_1^3}{8\times 50}$$

$$\Rightarrow A_3 = \frac{(6/50)A_1^3 + 0.06A_1^3}{8\times 50}$$

$$\Rightarrow A_3 = \frac{\left[0.12 + 0.06\right]A_1^3}{8\times 50}$$

$$A_3 = 0.00045A_1^3$$