PHYSICS EXAMINATION PROBLEMS
SOLUTIONS AND HINTS FOR STUDENT SELF-STUDY

Module Code and Lecturer	PHY1106: PV
Name of module	Waves section
Date of examination	June 2003

3(ii) Characteristic impedance is the resistance of a medium to the passage of a wave, and for mechanical waves is of the form force per unit medium displacement. z is proportional to $\sqrt{\rho}$.
$R = -1$, $T = 0$; End of string attached to rigid object.
Hints on sketch: as $z_2 \to \infty$, $R \to -1$; when $z_2 = 0$, $R = 1$. Smooth curve between theses limits, with $R = 0$ when $z_2 = z_1$.

4 (a) $\omega = 2\pi f$; (b) $k = 2\pi/\lambda$; (c) $v_p = \omega/k$.
31.4 s^{-1}; 3.93 m^{-1}; 1.6 m.
Sketch of displacement, hint: note this is a –ve sine function.
Sketch of P: (hints; $\cos^2$ function oscillates twice as fast as cos, and oscillates between 0 and 1: i.e. is never negative).
Mean value is $\langle P \rangle = \frac{1}{2} T \omega k A^2$.

5(i) See lecture notes.
A_1, positive x direction; A_2, negative x direction.
Derivation of A_{total}, and position of nodes, see lecture notes.

(ii) Definition, see lecture notes; $v_g = d\omega/dk$.
Dispersion curves: see lecture notes.