1. A particle is described by the wave function

$$\Psi = A\cos\left(\frac{2\pi x}{L}\right) for \; \frac{-L}{4} \le x \le \frac{L}{4}$$

$$=0 \quad for \; other \; values \; of \; x$$

(a) Determine the normalization constant A. (b) What is the probability that the particle will be found between x = -L/8 and x = L/8 if its position is measured? (c) What is the most probable position in the box? (d) What is the average value of position and momentum in the box?   **10 marks**

2. Consider a particle moving in a one-dimensional box of 2 L width for which the walls are at x= –L and x = L. (a) Write the time independent Schrödinger wave equation and solve it to obtain wave functions and probability densities for n = 1 and n = 2. (b) Sketch the wave functions and probability densities for these states.
                                                                15 marks

3. A particle of mass m is incident on a rectangular potential barrier of height V_o extended from x=0 to x=L. The energy of particle is $E = V_o + \frac{\hbar^2 \pi^2}{2mL^2}$. Write the time independent Schrödinger wave equation and the wave function in the three regions explicitly and by using the boundary conditions show that there is no reflected wave.
                                                                15 marks