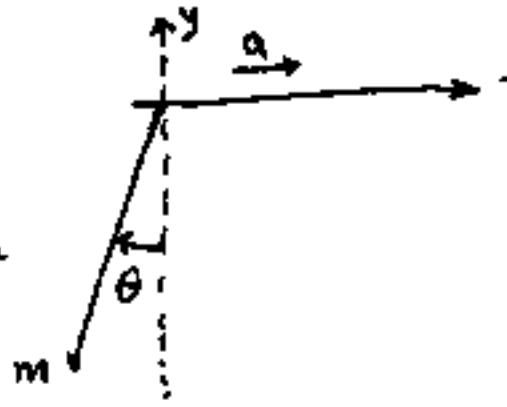
國立交通大學八十六學年度碩士班入學考試試題

科目：221普通物理（電子物理學系）　　共 4 題　　第 1 頁，共 [illegible]

※作答前，請先核對試題、答案卷(試卷)與准考證上之所組別與考試科目是否相符!!

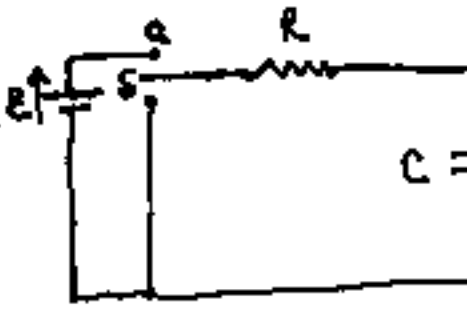
I. A simple pendulum with mass m and string length l is oscillating in an accelerating car with acceleration a in the horizontal direction. Find the equilibrium position of the pendulum, the differential equation of the motion and its angular frequency ω of the oscillation. (20%)



II. The mass density ρ of a system is given as $\rho=\rho_0$ for $r\le R$ and $\rho=0$ for $r>R$, where $r^2=x^2+y^2+z^2$. Find the potential energy for a point particle with unit mass at a point (x, y, z) in space, and also find the force acting on the point particle. (20%)

III. A system of ideal gas with temperature T, volume V and pressure P, performs a process of free expansion to volume $2V$. Calculate the entropy change of the system? (

IV. An R-C circuit is shown in the fig. At time $t=0$, the switch S is put in contact with a. Find the differential equation and its solution for the charge q on the capacitor C with the condition that at $t=0$, $\frac{dq}{dt}=\frac{\mathcal{E}}{R}$. (20%)



V. An electron with mass m and charge $-e$ is circulating around a proton with charge e in a stationary orbit. ① Assume the mass of the proton M is $>> m$, find the total energy of the electron. ② State the Bohr's quantization condition for this system, and find the energies of the quantized states. (20%)