國立嘉義大學九十二學年度轉學生招生考試試題

科目：普通物理　　（請將答案寫在答案卷上）

1. (15%) An 0.5 kg particle was attached by a spring moves in a frictionless horizontal plane as a simple harmonic motion X(t)=Asin(ωt+ ϕ) with X(0)=0.75m, V(1)= π m/s, period T=2s. Find that
   1) The angular frequency ω
   2) The phase constant ϕ
   3) The acceleration at the moment t=2, i.e. a(2)

2. (20%) We consider an Atwood machine in which two different objects, of mass m_1 and m_2, hang from a string that passes over a pulley of mass M and radius R., see Fig.2 (a) Show that the moment of inertia of the pulley is $\frac{1}{2}MR^2$. (b) Calculate the magnitude of the acceleration a of the two objects.

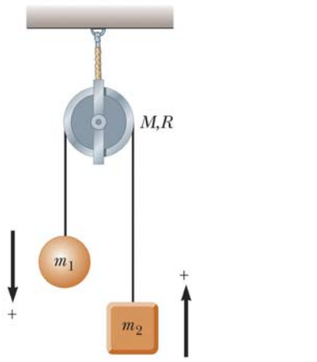

Fig.2

3. (15%) The water flows through a horizontal pipe into the atmosphere at a speed of v_1 as shown below, see Fig.3. Find that
   1) The volume flows out during 5 minutes
   2) The speed of water flow of left side v_2
   3) The gauge pressure of left side

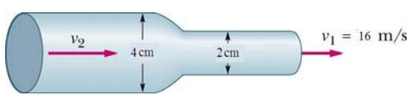

Fig.3

4. (15%) An uniform log with length L and mass M was attached to a wall and supported by a wire as shown in Fig.4. Find that
   1) Write the equilibrium equations of torques act on the log
   2) The tension of the wire
   3) The force of the hinge acts on the log

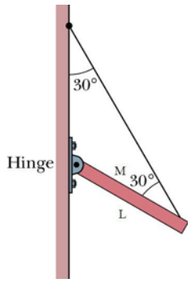

Fig.4

5. (15%). A long and straight wire carries a current I and lies in the plane of a rectangular wire loop of width w and length L as shown in Fig.5. (a) Determine the magnetic flux Φ_B through the loop due to the current I. (b) Suppose the current I = I_{max} sin(ωt+ ϕ), determine the induced emf ε in the loop.

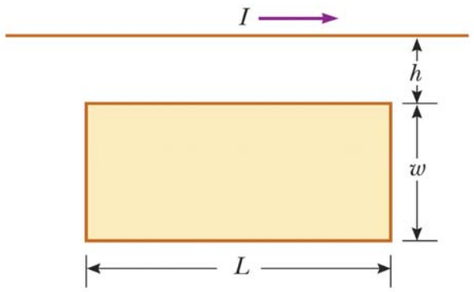

Fig.5

6. (20%) The switch in the circuit is closed at time t = 0. See fig.6 (a) Derive the differential equation of the current in the inductor by the Kirchhoff's laws for time t > 0. (b) Find the solution of the current in the inductor as function of time thereafter.

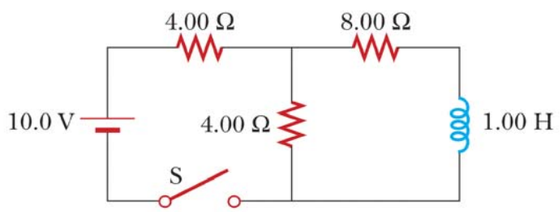

Fig.6