1. A block whose mass is 4 kg slides on a horizontal frictionless table with a constant speed 2 m/s. It is brought momentarily to rest by compressing a spring (the spring constant k is 1600 N/m) in its path. What distance d is the spring compressed? (10%)

2. FORMOSAT-2 a remote sensing satellite developed by National Space Organization, Taiwan. The satellite was launched onto the sun-synchronous orbit located at 891 kilometers above ground on May 21, 2004. A sun-synchronous orbit is a geocentric orbit which combines altitude and inclination in such a way that a satellite on that orbit ascends or descends over any given point of the Earth's surface at the same local mean solar time. Based on the sun-synchronous orbit, compute the speed and the orbit period of FORMOSAT-2. (10%)

   NOTE: earth's radius = 6.4×10^6 m, gravity=9.8 ms^{-2}

3. (a) What is Coriolis effect? (2%) (b) What is Coriolis effect in Northern hemisphere and Southern hemisphere? (4%) (c) What is Coriolis effect on Earth's equator and poles? (4%)

4. It is known that the sun light scattering from air molecule (or atom) depends on the wavelength, blue light being scattered more effectively than the red light. Please explain why the clear sky is blue (5%), and the color of sun is red at sunset? (5%)

5. Two waves, moving in the same direction along a stretched string, interfere with each other. The amplitude y of each wave is 10 mm. What phase difference ϕ between the two waves would result in an amplitude for the combined wave that is the same as y, 10 mm? (10%)

6. One more of ideal gas expands at a constant temperature T of 300 K from initial volume V_i of 10 L to a final volume V_f of 20 L. How much work is done by the expanding gas? (10%)
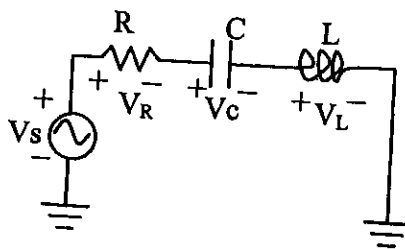
參考用

注意：背面有試題

7. Briefly describe (1) Gauss's law (5%), (2) Faraday's law (5%)

8. Three charges are fixed as in figure. (1) Sketch qualitatively the lines of force. (5%) (2) Locate the point(s) at which the electric field is zero. (10%)
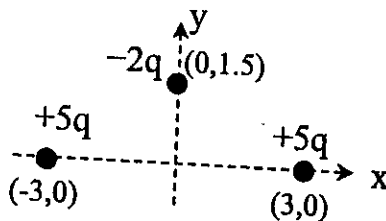
9. A circle loop of N turns with diameter **a** is rotated at a frequency **f** in a uniform magnetic field **B**. (1) What is the induced electromotive force (emf) appears in the loop. (5%) (2) How to design an alternating current generator and a direct current generator for output Vo, based on this device? (5%)
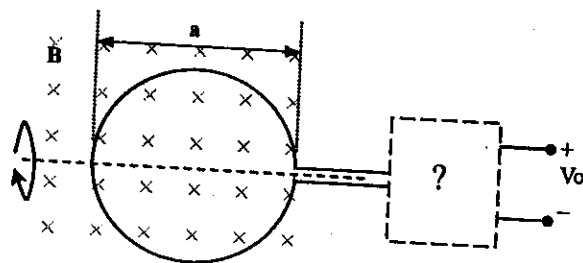
10. Please write down the differential equation for the RLC circuit, i.e. Vs in terms of Vc, R, L, and C. You do not need to solve the equation. (5%)