1. Three vertical parallel conducting wires with the same radius a are placed in the air and isolated from ground, as shown in Fig. 1. Assuming $d>>a$, determine the partial capacitances per unit length between the wires. (15%)

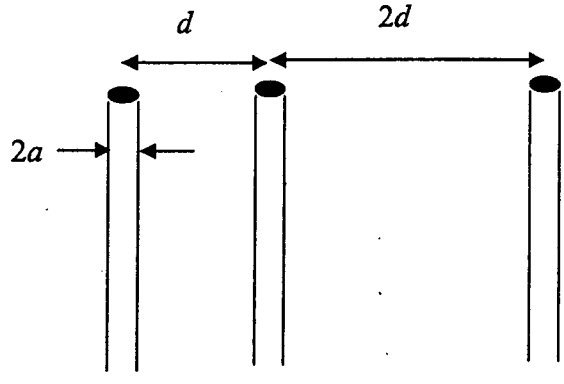

Fig. 1

2. A rectangular loop in the xy-plane with sides b_1 and b_2 carrying a current I lies in a uniform magnetic field $\mathbf{B}=\mathbf{a}_x B_x+\mathbf{a}_y B_y+\mathbf{a}_z B_z$ as shown in Fig. 2. Determine the force and torque on the loop. (15%)

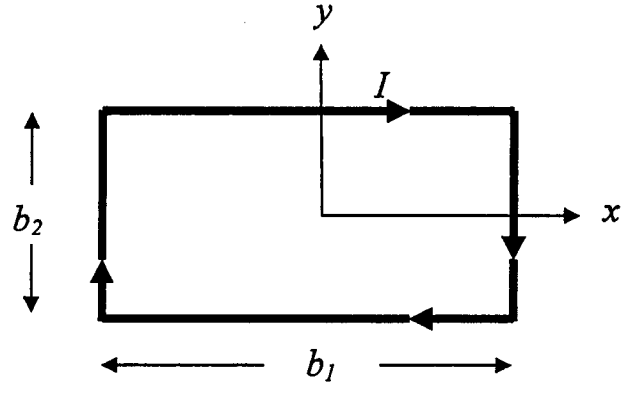

Fig. 2

3. A circular loop of M turns of conducting wire lies in the xy-plane with its center at the origin of a magnetic field specified by $\mathbf{B}=\mathbf{a}_z B_0 \cos(\pi r/2a)\cos\omega t$, where a is the radius of the loop and ω is the angular frequency. Find the emf induced in the loop. (15%)

4. An ac voltage source of amplitude V_0 and frequency f is applied to a parallel-plate capacitor C. Find the displacement current in the capacitor and the conduction current in the wires. (15%)

(背面仍有題目,請繼續作答)

5. Assuming a rectangular conducting sheet of conductivity σ, width a, and height b with the boundary conditions as shown in Fig. 3, find the potential distribution and current density everywhere within the sheet. (20%)

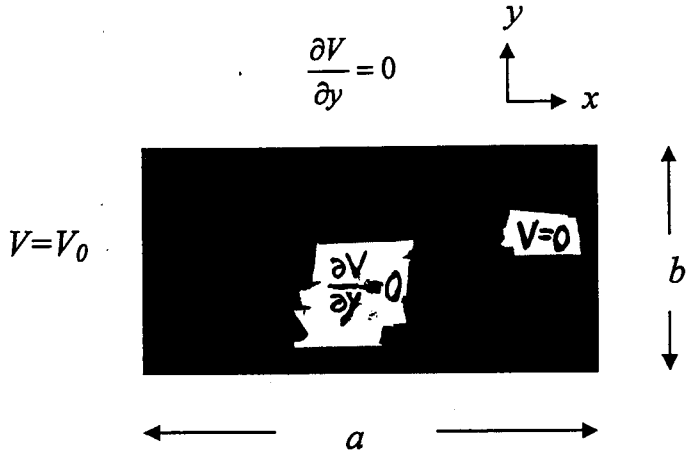

Fig. 3

6. Write down the differential forms of all the Maxwell's equations in cylindrical coordinate system. (10%)

7. The action current for an excited nerve may be considered as a circular current-carrying loop to generate the magnetic field intensity. Describe your design for measuring the magnetic field intensity. (10%)