※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

1. Write down the Stokes's theorem and explain why the Stokes's theorem sustains. **(20%)**

2. Derive the transformation matrix from Cartesian coordinate to cylindrical coordinate. Give a point K(3, -4, 2) and Vector $\mathbf{B}= (x+y)\mathbf{i}_y+x\mathbf{i}_z$. Express K and **B** in cylindrical coordinate and Evaluate **B** at K in the Cartesian and cylindrical coordinates. **(20%)**

3. A transmission line with 400m length in the circuit is shown in Figure 1. Calculate the voltage at point a and point b at (1) t=5μs and t=7μs. Wave velocity $u=2\times10^8$ m/s and the switch is closed at t=0. **(20%)**

4. For a magnetic vector potential $\mathbf{B}=-\rho^2 i_z$ Wb/m, calculate the total magnetic flux crossing the surface $\phi=\pi/2$, $2m\leqq\rho\leqq4m$, $0\leqq z\leqq2m$ **(20%)**

5. A coaxial cable with an insulating material of conductivity σ has the radius a of the central wire and the radius b of the whole cable. Show the resistance R of the cable per unit length, $R=[\ln(b/a)]/(2\pi\sigma)$. **(20%)**

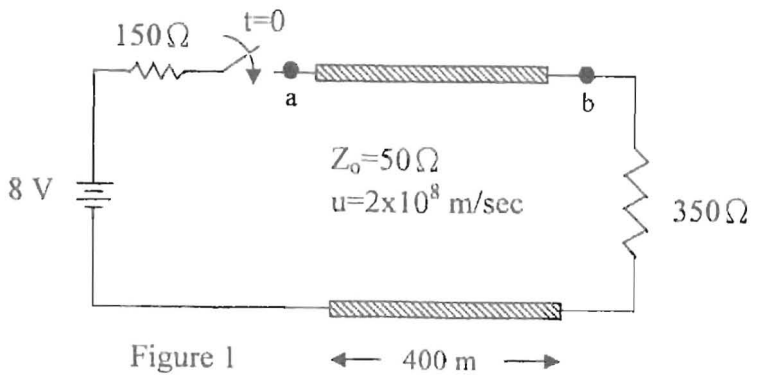

Figure 1