註：考生可否攜帶計算機或其他資料作答，請在備註欄註明（如未註明，一律不准攜帶）

背面有試題

（共六題，選答四題）

**Electromagnetic theory** (25 pts each)   May, 2005

■   Please write down your explanations or computations in detail; no calculator is allowed.

1. Consider a rectangular waveguide which is filled with polyethylene ($\varepsilon_r = 2.25$) sketched in the figure, with its rectangular cross section of sides a and b.

    (1) Explain what TE, TM and TEM modes are.   (5%)

    (2) Which kinds of modes mentioned above can be existed in this rectangular waveguide? (5%)

    (3) If a = 2cm, b = 1cm, list all the possible modes below 15GHz. (10%)

    (4) If a sinusoidal wave with a frequency 6GHz is incident into this waveguide, can it propagate through this waveguide? (Assume that there is no any loss for conductor wall and polyethylene.)   (5%)
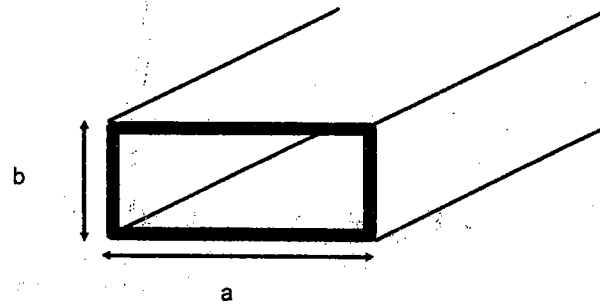
2. Consider the region enclosed on three sides by grounded conducting planes shown in the figure below. The end plate on the left is insulated from the grounded sides and has a constant potential V_0. All planes are assumed to be infinite in extent in the z-direction. Determine the potential distribution within this region. (25%)
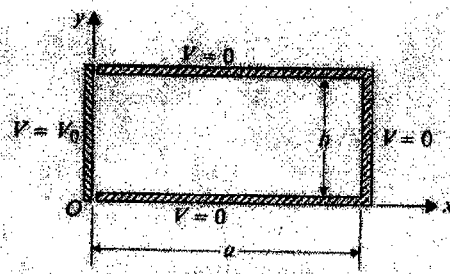
3. A uniform plane wave ($\overline{E}_i, \overline{H}_i$) of an angular frequency ω is incident from air on a plane dielectric boundary (semi-infinite) at an angle of incident θ_i with perpendicular polarization. Please express the following fields in phasor forms.