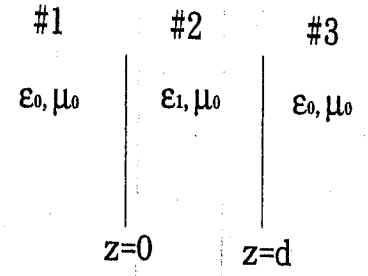
所別：電機工程學系碩士班 乙、丁組　科目：電磁學

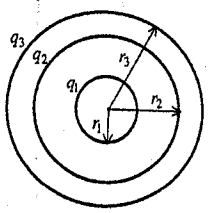
1. Consider a multi-layered structure as shown in the figure below. A plane wave is incident normally to layer #2 and #3 from layer #1.
   (A) (8%) Derive the equation for the reflection coefficient at z = 0.
   (B) (6%) Derive the equation for the reflection coefficient at z = -1(m).
   (C) (6%) If layer #3 is replaced by perfect electric conductor(PEC). Determine d such that the phase of the reflection coefficient at z = 0 is 0 degree.



2. (14%) Describe the single-stub method for impedance matching.

3. The standing-wave ratio on a lossless 50-(Ω) transmission line terminated in an unknown load impedance is found to be 3. The distance between successive voltage minima is 20(cm), and the first minimum is located at 5(cm) from the load. Determine
   (A) (8%) the reflection coefficient
   (B) (8%) the load impedance.

4. Three concentric conducting spherical shells having radii r_1, r_2, r_3 and charges q_1, q_2, q_3, respectively. Assume $r_1 < r_2 < r_3$.



   (A) (18%) What are the potentials on these spheres? (Hint: Find potential inside, outside, and on a single sphere first.)
   (B) (7%) If the sphere cell of radius r_1 is grounded (i.e. zero potential), what will be the change of the potential on the sphere of radius r_3?

5. (25%) An infinitely long conductor of radius a has a hole of radius b whose axis is parallel to but offset by a distance d from the axis of the conductor. Assume that a uniform current density **J** flows along the conductor. What is the magnetic field on the axis of the hole? (Hint: Use superposition)