

Jackson 3-12 3rd edition SML variant

An infinite, thin plane sheet of conducting material has an annular hole of inner radius b and outer radius a cut out of it. The annulus is filled with a sheet of the same material, but separated from the infinite sheet by two circular insulating rings. The annular region is maintained at potential V , while the rest of the sheet is grounded.

(a) Using appropriate cylindrical coordinates, find an integral expression involving Bessel functions for the potential at any point above or below the plane.

(b) Find the potential a perpendicular distance z above the center of the annulus.

(c) Consider the following limits, and discuss:

(i) $b \rightarrow 0$

(ii) $a \rightarrow \infty$

(iii) $z \gg a$