1. (a) State the Maxwell’s equations for Electricity and Magnetism in differential and integral forms that show ALL the terms. Show which terms are zero for the static case. (5 points); (b) How’s the electric field related to electric potential? (1 point); (c) What is the force experienced by a charge $q$ in an electric field $E(x, y, z)$ at a point $(x,y,z)$? (1 point); (d) What is the work done in moving a unit charge in an electric field $E(x, y, z)$ from point A to point B following a given path (or curve) ? (1 point); (e) Write the expression for the work done in part (d) in terms of the electric potential. (1 point), (f) What is the electric potential at a distance of $r$ from a charge $Q$. (1 point)

2. Determine the resistance of the insulation in a length $\ell$ of coaxial cable as shown in Fig. 1. (5 points)

![Figure 1](image)

3. Find the capacitance of a coaxial capacitor as shown in Fig.1. (5 points)

4. Derive Poisson's and Laplace's equations from Maxwell’s equations. (5 points)

5. (a) Solve the Laplace’s equation for a capacitor that has potential zero at bottom conductor, and has potential 100V at $z = d$. After solving for the potential as a function of $z$, find the electric field as well. (5 points)
(b) Suppose the electric potential is a function of only $x$, and $y$. Solve the Laplace’s equation in Cartesian coordinates. (5 points)