Q- An isolated charged conducting sphere of radius 15.0 cm creates an electric field of 4.90 $\times 10^4$ N/C at a distance 22.0 cm from its center.
(a) What is its surface charge density?
(b) What is its capacitance?

(a) The field outside a conducting sphere is same as if the charge on the sphere is as a point charge at its center and thus the total charge on the sphere is given by the relation

$$E = \frac{Q}{4\pi\epsilon_0 r^2}$$

Or $$Q = E * 4\pi\epsilon_0 r^2$$

This charge is uniformly distributed over the surface of the sphere of radius R thus the charge per unit area of the sphere i.e. the surface charge density is given by

$$\sigma = \frac{Q}{A} = \frac{E*4\pi\epsilon_0 r^2}{4\pi R^2} = \frac{4.90*10^4*8.85*10^{-12*}(0.22)^2}{(0.15)^2} = 9.33 * 10^{-7} C/m^2$$

(b) The capacitance of a conducting sphere is given by

$$C = 4\pi\epsilon_0 R = \frac{1}{9*10^9} * 0.15 = 1.67 * 10^{-11} F = 0.167\ pF$$