2SK3077 M-Umax

Up

$C_{eq} = 5+4 = 9$

$\frac{1}{C_{eq}} = \frac{1}{9} + \frac{1}{3} = \frac{4}{9} = \frac{9}{4} = 2.25\,\mu F$

Middle

$C_{eq} = 2+3+7 = 12\,\mu F$

$\frac{1}{C_{eq}} = \frac{1}{12} + \frac{1}{6} = \frac{3}{12}$, $C_{eq} = 4\,\mu F$

$C_{eq} = 2.25 + 4 = 6.25$

$C_{2-2} = \frac{A\varepsilon_0}{d}$

$C_{2-3} = \frac{A\varepsilon_0}{2d}$

$q_2 = C_{12}(V_1 - V_2)$
$= -\frac{A\varepsilon_0 V}{d}$

$q_3 = C_{23}(V_3 - V_2)$
$= -\frac{A\varepsilon_0 V}{2d}$

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Charge on plate 2 is $(-q_2) + (-q_3) = 0$

$q_2 + q_3 = -0$

$q_2 = -\frac{A\varepsilon_0 V}{d}$ $q_2 = -\frac{A\varepsilon_0 V}{2d}$

$q_2 = 2q_3$

$q_3 + 2q_3 = -0$

$q_3 = -\frac{0}{3}$

$q_2 = -\frac{2(0)}{3}$

Then P.d

$$q = -\frac{A\varepsilon_0 V}{d}$$

$$\frac{A\varepsilon_0 V}{d} = \frac{2Q}{3}$$

$$V = \frac{2Qd}{3A\varepsilon_0}$$ as $V_2 = V_3 = 0$

So P.d on all plates must be

$$\left[V = \frac{2Qd}{3A\varepsilon_0} \right]$$

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3. Electric field at distance x = $E = \frac{\lambda}{2\pi\varepsilon_0 x}$

$$V = \int_{r}^{D} \frac{\lambda}{2\pi\varepsilon_0 x}\, dx$$

$$V = \frac{\lambda}{2\pi\varepsilon_0} \ln\left(\frac{D}{r}\right)$$

$$C = \frac{\lambda}{V} = \frac{2\pi\varepsilon_0}{2\ln(D/r)}$$

$$\boxed{\frac{C}{\ell} = \frac{\pi\varepsilon_0}{\ln(D/r)}}$$

GENIUS

Date

4. $F_g = F_E$

$mg = qE$

$E = \frac{mg}{q}$

$E = \frac{0.01 * 9.8}{20.7 \times 10^{-6}} = 4.74 \times 10^3$

$E = \frac{\sigma}{2\varepsilon_0}$ $\quad \sigma = 2\varepsilon_0 E$

$2(8.85 \times 10^{-12})(4.74 \times 10^3) = \boxed{8.4 \times 10^{-8} \ C/m^2}$

n. P.d

∴ Sy Initial $C_1 V_0$

C_2 & C_3 - uncharged

$$q_1 + q_2 + q_3 = C_1 V_0$$

$$q_i = C_i V_f \quad (i = 1, 2, 3)$$

$$V_f = \frac{C_1 V_0}{C_1 + C_2 + C_3} \qquad q_i = C_i V_f = \frac{C_i}{C_1 + C_2 + C_3} C_1 V_0$$

$$\boxed{q_3 = \frac{C_1^2}{C_1 + C_2 + C_3} V_0} \qquad \boxed{q_2 = \frac{C_2 C_2}{C_1 + C_2 + C_3} V_0}$$

$$\boxed{q_3 = \frac{C_2 C_3}{C_1 + C_2 + C_3} V_0}$$