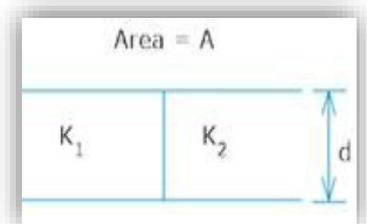


Topic-Capacitor
Subjects- Physics

Assignment – 4

1. Why does the electric field inside a dielectric decrease when it is placed in an external electric field? 1
2. The Plates of a charged capacitor are connected by a voltmeter. If the plates of the capacitor are moved further apart. What will be the effect on the reading of the voltmeter? 1
3. What happens to the capacitance of a capacitor when a dielectric slab is placed between its plates? 1
4. A parallel plate capacitor with air between the plates has a capacitance of $8pF$. What will be the capacitance if the distance between the plates is reduced by half and the space between them is filled with a substance of dielectric constant 6? 2

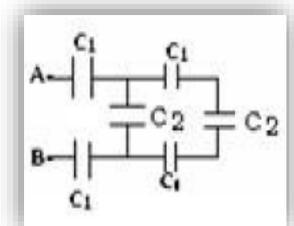
5. The distance between the plates of a parallel plate capacitor is d . A metal plate of thickness $\left(\frac{d}{2}\right)$ is placed between the plates. What will be the effect on the capacitance? 2



6. Two dielectric slabs of dielectric constant K_1 & K_2 are filled in between the two plates, each of area A , of the parallel plate capacitor as shown in the figure. Find the net capacitance of the capacitor? Area of each plate = $\frac{d}{2}$ 3

7. Prove that the energy stored in a parallel plate capacitor is given by $\frac{1}{2}CV^2$? 3
8. Keeping the voltage of the charging source constant. What would be the percentage change in the energy stored in a parallel plate capacitor if the separation between its plates were to be decreased by 10%? 3

9. If $C_1 = 3pF$ & $C_2 = 2pF$, calculate the equivalent capacitance of the given network between points A & B? 3



10. Prove that energy stored per unit volume in a capacitor is given by $\frac{1}{2}\epsilon_0 E^2$, where E is the electric field of the capacitor? 3
11. Three capacitors each of capacitance $9pF$ are connected in series.
 1. What is the total capacitance of the combination?
 2. What is the potential difference across each capacitor if the combination is connected to a 120 V supply3
12. Three capacitors of capacitances $2pF, 3pF$ & $4pF$ are connected in parallel.
 1. What is the total capacitance of the combination?

2. Determine the charge on each capacitor if the combination is connected to a 100 V supply. **3**
- 13.** In a parallel plate capacitor with air between the plates, each plate has an area of $6 \times 10^{-3} m^2$ and the distance between the plates is 3 mm. Calculate the capacitance of the capacitor. If this capacitor is connected to a 100 V supply, what is the charge on each plate of the capacitor? **3**
- 14.** A $600 pF$ capacitor is charged by a 200 V supply. It is then disconnected from the supply and is connected to another uncharged $600 pF$ capacitor. How much electrostatic energy is lost in the process? **3**
- 15.** (a) Define dielectric constant in terms of the capacitance of a capacitor? On what factor does the capacitance of a parallel plate capacitor with dielectric depend?
 (b) Find the ratio of the potential differences that must be applied across the
 (1) Parallel (2) Series combination of two identical capacitors so that the energy stored in the two cases becomes the same. **5**
- 16.** (a) An air filled capacitor is given a charge of $2 \mu C$ raising its potential to 200 V. If on inserting a dielectric medium, its potential falls to 50 V, what is the dielectric constant of the medium?
 (b) A conducting slab of thickness 't' is introduced without touching between the plates of a parallel plate capacitor separated by a distance d ($t < d$). Derive an expression for the capacitance of a capacitor? **5**

For detail study, numerical problems & conceptual questions Click below

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