PREVIOUS YEARS' QUESTIONS EXERCISE-II

1. If there are n capacitors in parallel connected to V volt source, then the energy stored is equal to- **[AIEEE - 2002]**

(1) CV (2) $\frac{1}{2}nCV^2$

(3) CV^2 (4) $\frac{1}{2n}CV^2$

2. Capacitance (in F) of a spherical conductor having radius 1 m, is- **[AIEEE - 2002]**

(1) 1.1×10^{-10} (2) 10^{-6}

(3) 9×10^{-9} (4) 10^{-3}

3. A sheet of aluminium foil of negligible thickness is introduced between the plates of a capacitor. The capacitance of the capacitor- **[AIEEE - 2003]**

(1) decreases

(2) remains unchanged

(3) becomes infinite

(4) increases

4. The work done in placing a charge of 8×10^{-18} C on a condenser of capacity 100 micro-farad is- **[AIEEE - 2003]**

(1) 16×10^{-32} J (2) 3.1×10^{-26} J

(3) 4×10^{-10} J (4) 32×10^{-32} J

5. A fully charged capacitor has a capacitance C. It is discharged through a small coil of resistance wire embedded in a thermally insulated block of specific heat capacity s and mass m. If the temperature of the block is raised by ΔT, the potential difference V across the capacitance is- **[AIEEE - 2005]**

(1) $\sqrt{\frac{2mC\Delta T}{s}}$ (2) $\frac{mC\Delta T}{s}$

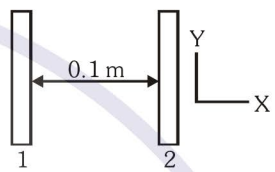
(3) $\frac{ms\Delta T}{C}$ (4) $\sqrt{\frac{2ms\Delta T}{C}}$

6. A parallel plate capacitor is made by stacking n equally spaced plates connected alternatively. If the capacitance between any two adjacent plates is C, then the resultant capacitance is- **[AIEEE - 2005]**

(1) (n–1)C (2) (n+1)C

(3) C (4) nC

7. Two insulating plates are both uniformly charged in such a way that the potential difference between them is $V_2 - V_1 = 20$ V. (i.e., plate 2 is at a higher potential). The plates are separated by d = 0.1 m and can be treated as infinitely large. An electron is released from rest on the inner surface of plate 1. What is its speed when it hits plate 2 ? ($e = 1.6 \times 10^{-19}$ C, $m_0 = 9.11 \times 10^{-31}$ kg) **[AIEEE - 2006]**



(1) 2.65×10^6 m/s (2) 7.02×10^{12} m/s

(3) 1.87×10^6 m/s (4) 32×10^{-19} m/s

8. A battery is used to charge a parallel plate capacitor till the potential difference between the plates becomes equal to the electromotive force of the battery. The ratio of the energy stored in the capacitor and the work done by the battery will be- **[AIEEE - 2007]**

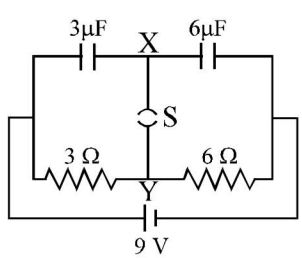
(1) 1 (2) 2 (3) 1/4 (4) 1/2

9. A parallel plate condenser with a dielectric of dielectric constant K between the plates has a capacity C and is charged to a potential V volts. The dielectric slab is slowly removed from between the plates and then re-inserted. The net work done by the system in this process is- **[AIEEE - 2007]**

(1) $\frac{1}{2}(K-1)CV^2$ (2) $CV^2(K-1)/K$

(3) $(K-1)CV^2$ (4) zero

10. A circuit is connected as shown in the figure with the switch S open. When the switch is closed, the total amount of charge that flows from Y to X is **[IIT-JEE 2007]**



(1) 0 (2) 54 μC (3) 27 μC (4) 81 μC

11. A parallel plate capacitor with air between the plates has a capacitance of 9 pF. The separation between its plates is 'd'. The space between the plates is now filled with two dielectrics. One of the dielectric has dielectric constant $K_1 = 3$ and thickness $\frac{d}{3}$ while the other one has dielectric constant $K_2 = 6$ and thickness $\frac{2d}{3}$. Capacitance of the capacitor is now **[AIEEE 2008]**

(1) 1.8 pF (2) 45 pF

(3) 40.5 pF (4) 20.25 pF

12. **Statement-1 :** For practical, the earth is used as a reference at zero potential in electrical circuits.

and

Statement-2 : The electrical potential of a sphere of radius R with charge Q uniformly distributed on the surface is given by $\frac{Q}{4\pi\varepsilon_0 R}$. **[IIT-JEE 2008]**

(1) Statement-1 is True, Statement-2 is True ; statement-2 is a correct explanation for statement-1

(2) Statement-1 is True, Statement-2 is True ; statement-2 is NOT a correct explanation for statement-1

(3) Statement-1 is True, Statement-2 is False

(4) Statement-1 is False, Statement-2 is True

13. Let C be the capacitance of a capacitor discharging through a resistor R. Suppose t_1 is the time taken for the energy stored in the capacitor to reduce to half its initial value and t_2 is the time taken for the charge to reduce to one-fourth its initial value. Then the ratio t_1/t_2 will be : **[AIEEE 2010]**

(1) 2 (2) 1 (3) 1/2 (4) 1/4

14. A resistor 'R' and 2μF capacitor in series is connected through a switch to 200 V direct supply. Across the capacitor is a neon bulb that lights up at 120 V. Calculate the value of R to make the bulb light up 5s after the switch has been closed. ($\log_{10} 2.5 = 0.4$) **[AIEEE 2011]**

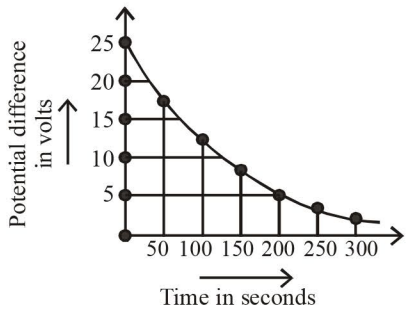
(1) $2.7 \times 10^6\ \Omega$ (2) $3.3 \times 10^7\ \Omega$

(3) $1.3 \times 10^4\ \Omega$ (4) $1.7 \times 10^5\ \Omega$

15. Combination of two identical capacitors, a resistor R and a dc voltage source of voltage 6V is used in an experiment on (C–R) circuit. It is found that for a parallel combination of the capacitor the time in which the voltage of the fully charged combination reduces to half its original voltage is 10 second. For series combination the time needed for reducing the voltage of the fully charged series combination by half is:- **[AIEEE 2011]**

(1) 20 sec. (2) 10 sec. (3) 5 sec. (4) 2.5 sec.

16.



The figure shows an experimental plot for discharging of a capacitor in an R–C circuit. The time constant τ of this circuit lies between :- **[AIEEE 2012]**

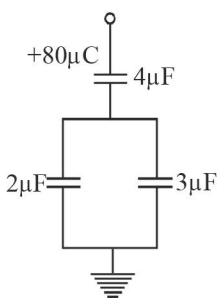
(1) 100 sec and 150 sec

(2) 150 sec and 200 sec

(3) 0 and 50 sec

(4) 50 sec and 100 sec

17. In the given circuit, a charge of +80 μC is given to the upper plate of the 4μF capacitor. Then in the steady state, the charge on the upper plate of the 3μF capacitor is **[IIT-JEE 2012]**



(1) + 32 μC (2) + 40μC

(3) +48μC (4) + 80μC

18. Two capacitors C_1 and C_2 are charged to 120V and 200V respectively. It is found that by connecting them together the potential on each one can be made zero. Then : **[JEE(Main)-2013]**

(1) $5C_1 = 3C_2$ (2) $3C_1 = 5C_2$

(3) $3C_1 + 5C_2 = 0$ (4) $9C_1 = 4C_2$

19. A parallel plate capacitor is made of two circular plates separated by a distance of 5 mm and with a dielectriic of dielectric constant 2.2 between them. When the electric field in the dielectric field in the dielectric is 3×10^4 V/m, the charge density of the positive plate will be close to : **[JEE(Main)-2014]**

(1) $3 \times 10^4\ C/m^2$

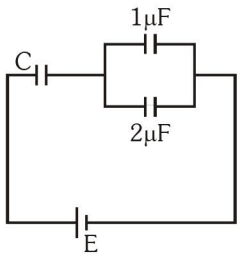
(2) $6 \times 10^4\ C/m^2$

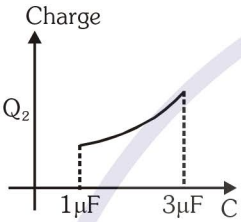
(3) $6 \times 10^{-7}\ C/m^2$

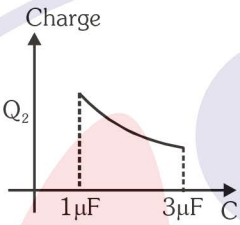
(4) $3 \times 10^{-7}\ C/m^2$

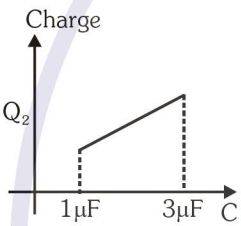
20. In the given circuit, charge Q_2 on the 2μF capacitor changes as C is varied from 1μF to 3μF. Q_2 as a function of 'C' is given properly by : (figures are drawn schematically and are not to scale):-

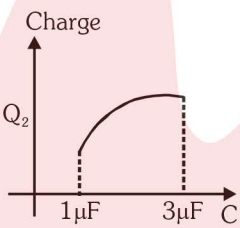
[JEE(Main)-2015]



(1) 

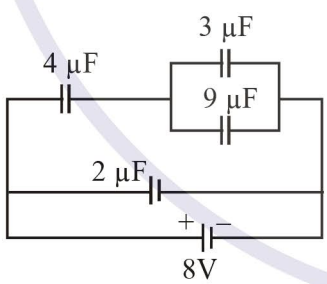
(2) 

(3) 

(4) 

21. A combination of capacitors is set up as shown in the figure. The magnitude of the electric field, due to a point charge Q (having a charge equal to the sum of the charges on the 4 μF and 9 μF capacitors), at a point 30 m from it , would equal:

[JEE(Main)-2016]

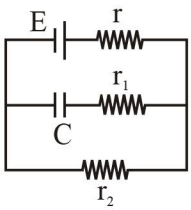


(1) 480 N/C (2) 240 N/C

(3) 360 N/C (4) 420 N/C

22. In the given circuit diagram when the current reaches steady state in the circuit, the charge on the capacitor of capacitance C will be :

[JEE-Main-2017]



(1) $CE\frac{r_2}{(r+r_2)}$ (2) $CE\frac{r_1}{(r_1+r)}$

(3) CE (4) $CE\frac{r_1}{(r_2+r)}$

23. A capacitance of 2 μF is required in an electrical circuit across a potential difference of 1.0 kV. A large number of 1 μF capacitors are available which can withstand a potential difference of not more than 300 V. The minimum number of capacitors required to achieve this is : **[JEE-Main-2017]**

(1) 24 (2) 32 (3) 2 (4) 16

24. A parallel plate capacitor of capacitance 90 pF is connected to a battery of emf 20V. If a dielectric material of dielectric constant $K = \frac{5}{3}$ is inserted between the plates, the magnitude of the induced charge will be :- **[JEE-Main-2018]**

(1) 0.3 n C (2) 2.4 n C

(3) 0.9 n C (4) 1.2 n C

PREVIOUS YEARS QUESTIONS				ANSWER KEY						Exercise-II
Que.	1	2	3	4	5	6	7	8	9	10
Ans.	**2**	**1**	**2**	**4**	**4**	**1**	**1**	**4**	**4**	**3**
Que.	11	12	13	14	15	16	17	18	19	20
Ans.	**3**	**1**	**4**	**1**	**4**	**1**	**3**	**2**	**3**	**4**
Que.	21	22	23	24						
Ans.	**4**	**1**	**2**	**4**						