Unit: 1. Electrostatics (25 marks)	
1 mark → 4 Questions	5 mark → 1 Question 51
3 mark → 2 Question 31, 32	10 mark→ 1 Question 63

UNIT – 1. Electrostatics – 1 mark questions

1. An example of conductor is ------
a) glass ***b) human body***
c) dry wood d) ebonite [S-08]

2. Which of the following is not a dielectric? -----
a) Ebonite b) Mica
c) Oil ***d) Gold*** [J-07]

3. The law which govern the forces between the charges is -----
a) Ampere's law b) Faraday's law
c) Coulomb's law d) Ohm's law (S-07)

4. The unit of permittivity is ------ [DPM, M-08,J-08,S-08,J-11,S-12]
a) $NC^{-2}m^{-2}$ b) $NC^{2}m^{-2}$
c) Hm^{-1} ***d) $C^2N^{-1}m^{-2}$***

5. The unit of relative permittivity is ------
a) $C^2N^{-1}m^{-2}$ b) Nm^2C^{-2}
c) No unit d) $NC^{-2}m^{-2}$ [J-12]

6. The value of relative permittivity of air is --- [M-12]
a) $8.854 \times 10^{-12}\ C^2N^{-1}m^2$ b) $9 \times 10^9\ N^{-1}m^{-2}$
c) 1 d) 8.854×10^{12}

7. The quantization of electric charge is given ---- [S-08]
a) ***q = ne*** b) q = cv
c) q = e/n d) q = c/v

8. The unit of number of electric lines of force passing through a given area is ---- [M-11]
a) no unit b) NC^{-1}
c) Nm^2C^{-1} d) Nm

9. The unit of electric field intensity is ------ [O-06,J-08,M-09]
a) NC^{-2} b) NC
c) Vm^{-1} d) Vm

10. Two point charges +q and –q are placed at points A and B respectively separated by a small distance. The electric field intensity at the midpoint of AB [M-13]
a) is zero ***b) acts along AB***
c) acts along BA d) acts perpendicular to AB

11. The direction of electric field at a point on the equatorial line due to an electric dipole is ------ [J-07]
a) along the equatorial line towards the dipole
b) along the equatorial line away from the dipole
c) parallel to the axis of the dipole and acts opposite to the direction of the dipole moment
d) parallel to the axis of the dipole and in the direction of dipole moment

12. The intensity of electric field at point is equal to ----- [O-10]
a) the force experienced by a charge q
b) the workdone in bringing unit positive charge from infinity to that point
c) the positive potential gradient
d) the negative gradient of potential

13. The electric field intensity at a short distance r from a uniformly charged infinite plane sheet of charge is – [J-12,S-12]
a) proportional to r b) proportional to 1/r
c) proportional to $1/r^2$ ***d) independent of r***

14. The electric field intensity at a distance r from an infinitely long uniformly charged straight wire is directly proportional to - [J-10]
a) r ***b) r^{-1}***
c) r^2 d) r^{-2}

15. The unit of electric dipole moment is – [S-12]
a) volt/metre (v/m) b) coulomb/metre (c/m)
c) volt . metre ***d) Coulom. Metre***

16. An electric dipole is placed in a uniform electric field with its axis parallel to the field. It experiences [DPM,M-06,07,08,S-07, 08, J-13]
a) only a net force
b) only torque
c) both a net force and torque ***d) neither a net force nor a torque***

17. An electric dipole is placed in a non-uniform electric field with its experiences ----- [S-08]
a) only a net force b) only torque
c) both a net force and torque d) Neither a net force and a torque

18. An electric dipole of moment $\vec{P}$ is placed in a uniform electric field of intensity $\vec{E}$ at an angle θ with respect to the field. The direction *of torque is ----- [M-10]*
a) along the direction of p b) opposite to the direction of P
c) along the direction E ***d) perpendicular to the plane containing $\vec{P}$ and $\vec{E}$***

19. An electric dipole of dipole moment 'p' is kept parallel to an electric field of intensity 'E'. The workdone in rotating the dipole through 90^0 is :
a) Zero b) –pE ***c) pE*** d) 2pE [M-13]

20. If a point lies at a distance x from the mid-point of the dipole, the electric potential at this point is proportional to ---
a) ***$1/x^2$*** b) $1/x^3$
c) $1/x^4$ d) $/x^{3/2}$ [M-11]

21. The electric potential energy (U)of two point charges is -----
a) $\frac{q_1 q_2}{4\pi\varepsilon_0 r^2}$ b) $\frac{q_1 q_2}{4\pi\varepsilon_0 r}$ c) PE cos θ d) PE sinθ [J-06,J-11]

22. The torque (τ) experienced by an electric dipole placed in a uniform electric field (E) at an angle θ with the field is -- [J-09]
a) PEcosθ b) –PEcosθ
c) PEsinθ d) 2 PEsinθ

23. Electric potential energy of an electric dipole in an electric field is given as --- (M-07)
a) pEsinθ b) - pEsinθ
c) pEcosθ d) -***PEcosθ***

24. The negative gradient of potential is ----- [J-09]
a) electric force b) torque
c) electric current ***d) electric field intensity***

25. The electric field outside the two oppositely charged plane sheets each of charge density σ is ---- [M-06,S-09,J-11,M-13]
a) σ/ε b) - σ/2ε
c) 2σ/ε ***d) zero***

26. The electric field inside the plates of two oppositely charged plane sheets each of charge density σ is ---- [J-13]
a) + σ/2ε b) - σ/2ε
c) σ/ε d) zero

27. The unit electric flux is ---- [M-06,J-09]
a) ***Nm^2C^{-1}*** b) $Nm^{-2}C^{-1}$
c) Nm^2C d) $Nm^{-2}C$

28. Which of the following is a scalar [J-06,J-08,M-09,12,O-11,M-13]
a) electric force b) electric field
c) dipole ***d) electric potential***

29. A hollow metallic spherical shell carrying electric charge produce no electric fields at points ------ [J-06,13,M-10,12]
a) on the surface of the sphere ***b) inside the sphere***
c) at infinite distance from the centre of the sphere
d) outside the sphere

30. Four charge s +q, +q, -q, and –q respectively are placed at the corners A, B, C, and D of a square of side a. The electric potential at the centre O of the square is ------- [O-06]
a) $\frac{1}{4\pi\varepsilon_0}\frac{q}{a}$ b) $\frac{1}{4\pi\varepsilon_0}\frac{2q}{a}$ c) $\frac{1}{4\pi\varepsilon_0}\frac{4q}{a}$ ***d) ZERO***

31. The capacitance of a capacitor is --- [O-10]
a) directly proportional to charge q given to it
b) inversely proportional to its potential
c) directly proportional to charge q and inversely proportional to its potential V
d) independent of both charge q and potential V

32. When the charge given to the capacitor is doubled, its capacitance ---- [M-12]
a) increases twice b) decreases twice
c) increases four times ***d) does not change***

33. A dielectric medium is placed in an electric field E_0. The field induced inside the medium is ----- [J-11]
a) acts in the direction of electric field E_0
b) acts opposite to E_0 c) acts perpendicular to E_0 d) is zero

34. A non-polar dielectric is placed in an electric field (E). Its induced dipole moment --- [O-11]
a) zero ***b) acts in the direction of E***
c) acts opposite to the direction of E
d) acts perpendicular to E

35. A lightning arrestors works on the principle of--- [O-98,O-06]
a) corona discharge b) diffusion of charge
c) discharge of electricity d) separation of charges

UNIT – 1. Electrostatics – 1 mark problems questions

1. The permittivity of vacuum ε_0 equals ----- [O-06]
a) 9×10^9 Nm^2C^{-2} b) 1 $C^2N^{-1}m^{-2}$
c) $1/9 \times 10^9$ $C^2N^{-1}m^{-2}$ d) $1/4\pi \times 9 \times 10^9$ $C^2N^{-1}m^{-2}$

2. The total flux over a closed surface enclosing a charge 'q' (in Nm^2C^{-1}) [J-13]
a) $8\pi q$ b) 9×10^9 q
c) $36\pi \times 10^9$ q d) 8.854×10^{-12} q

3. The capacitance of a parallel plate capacitor increases from 5 μF to 60 μF when a dielectric is filled between the plates. The dielectric constant of the slab is ----- [J-08,O-10,M-11]
a) 65 b) 55
c) 12 d) 10

4. The capacitance of a parallel plate capacitor increases from 5μF to 50 μF when a dielectric is filled between the plates. The permittivity of dielectric is ---- [J-09]
a) 8.854×10^{-12} $C^2N^{-1}m^{-2}$ ***b) 8.854×10^{-11} $C^2N^{-1}m^{-2}$***
c) 12 d) 10

5. The magnitude of charge acting on a charge of 2×10^{-10} C placed in a uniform electric field of 10 Vm^{-1} is ----- [M-09]
a) 2×10^{-9} N b) 4×10^{-9} N
c) 2×10^{-10} N d) $4x\ 10^{-10}$ N

6. Intensity electric field produces a force of 10^{-5} N on a charge of 5 μC is ----- [M-11]
a) 5×10^{-11} NC^{-1} b) 50 NC^{-1}
c) 2 NC^{-1} d) 0.5 NC^{-1}

7. The electric field intensity is 400 V/m at a distance of 2 m from a point charge. it will be 100 V/m at a distance of [M-07,J-12,S-12]
a) 50 cm b) 4 cm
c) 4 m d) 1.5 m

8. The number of lines that radiate outwards from one coulomb charge is
a) 1.13×10^{11} b) 8.85×10^{-11}
c) 9×10^9 d) infinite

9. The number of lines of force emerging from one micro coulomb of charge is ------ [S-07]
a) 1.129×10^5 b) 1.6×10^{-19}
c) 6.25×10^{-18} d) 8.85×10^{-12}

10. The ratio of electric potentials at points 10 cm and 20 cm from the centre of an electric dipole along its axial line is ----- [J-10]
a) 1:2 b) 2:1 c) 1:4 ***d) 4:1***

11. Torque on a dipole in a uniform electric field is maximum when the angle between P and E is ------ [J-06,S-09]
a) 0^0 ***b) 90^0*** c) 45^0 d) 180^0

12. The potential energy of two equal point charges of magnitude 2 μC placed 1 m apart in air is --- [J-06]
a) 2 J b) 0.36 J c) 4 J ***d) 0.036 J***

13. On moving a charge of 20 C by 2 cm, 2J of work is done, then the potential difference between the points is -----
a) 0.5 V ***b)0.1 V*** c) 8 V d) 2 V

14. The work done in moving 4μC charges from one point to another in an electric field is 0.012J. The potential difference between them is ----- [M-06]
a) 3000 V b) 6000 V
c) 30 V d) 48×10^3 V

15. The workdone in moving 500 μC charge between two points on equipotential surface is [J-07, M-08,M-10,J-10,O-11,M-12,J-12]
a) zero b) finite +ve
c) finite –ve d) infinite

16. When a point charge of 6 μC is moved between two points in an electric field, workdone is 1.8×10^{-5} V. The potential difference between the two points is --- (S-09)
a) 1.08 V b) 1.08 μV ***c) 3 V*** d) 30 V

17. When an electric dipole of dipole moment P is aligned parallel to the electric field E then the potential energy of the dipole is given as [J-08]
a) PE b) zero ***c) -PE*** d) PE /√2

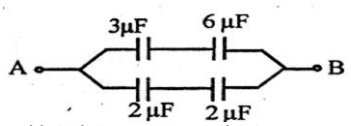
18. A capacitor of capacitance 6 μF is connected to a 100 V battery. The energy stored in the capacitor is ---[M-08]
a) 30 J b) 3 J ***c) 0.03 J*** d) 0.06 J

19. The effective capacitance of two capacitors connected in series is 1.5 μF. If the capacitance of one capacitor is 4 μF , then the capacitance of the other is --- [S-07,09]
a) 2.4 μF b) 0.24 μF c) 0.417 μF
d) 4.17 μF

20. Three capacitances 1 μF, 2 μF and 3 μF are connected in series. The effective capacitance of the capacitors is -- [M-10]
a) 6 μF b) 11/6 μF ***c) 6/11 μF*** d) 1/6 μF

21. n capacitors of capacitance C connected in series. The effective capacitance is ---- [O-11]
a)n/C ***b) C/n*** c) nC d) C

22. In the given circuit, the effective capacitance between A and B will be ----- [J-07]



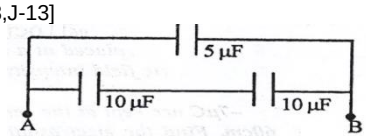
a) 3 μF b) 36/13 μF c) 13 μF d) 7 μF

UNIT – 1. Electrostatics – 3 mark Questions

1. What do mean by additive nature of charges? (S-07)
2. State coulomb's law in electrostatic. [DPM,J-07,M-10,J-10,O-11,J-12]
3. Define coulomb on the basis of Coulomb's law. [M-06,M-09,O-10,M-13]
4. Mention any 3 properties of electric lines of force [J-10,S-12]
5. What is an electric dipole moment? Define electric dipole moment. [S-09,J-11]
6. Explain the working of microwave oven. [J-08]
7. Define electric potential at a point. [M-07,J-09,13]
8. Why is it safer to be inside a car than standing under a tree during lightning? [DPM, M-06, J-06,J-09,M-10]
9. What is polar molecule? Give any two examples. [M-0,137]
10. What is non-polar molecule ? Give example [O-10,J-11]
11. Define electric flux. Give its unit. [J-08,J-12]
12. State Gauss's law in electrostatics. [J-06,0-6,M-11]
13. What is electrostatic shielding? [M-08]
14. What is carona discharge? What are its advantages? [J-07]
15. What is capacitor? Define its capacitance. [M-09,S-12]
16. What are the uses of capacitors? (S-07,M-11,12)
17. What is carona discharge? [S-08]
18. What is meant by dielectric polarisation? [O-11]

UNIT – 1. Electrostatics – 3 mark Questions

1. Three capacitors each of capacitance 9 pF are connected in series. What is the total capacitance of the combination? [M-08]
2. Calculate the effective capacitance of the combination shown in figure: [S-08,J-13]



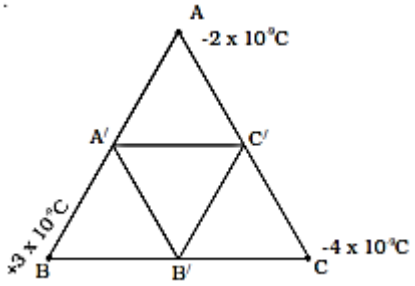
3. Calculate the potential at a point due to a charge of 4 X 10^{-7}C located at 0.09 m away from it. [M-12]

UNIT – 1. Electrostatics – 5 mark Questions

1. Write the properties of electric lines of force. [M-07,S-07,M-08,M-10,11,O-11,M-13]
2. Derive an expression torque experienced by an electric dipole placed in a uniform electric field. [O-10,S-12]
3. Define electric potential at a point. Obtain an expression for electric potential due to single charge. [M-09]
4. What is electrostatic potential energy of a system two point charges? Deduce an expression for it. [S-09]
5. Deduce an expression for the capacitance of a parallel plate capacitor [J-10]
6. Derive an expression for the capacitance of a parallel plate capacitor with a dielectric medium. [J-13]
7. Prove that the energy stores in a capacitor is $q^2/2C$. [M-12]

UNIT – 1. Electrostatics – 5 mark Questions - numerical

1. A square of side 1.3 m has the charges +12 nC, -24 nC, +31 nC and 17 nC at its corners. Calculate the electric potential at its centre. [J-07]
2. Three charges -2 x 10^{-9} C, +3 x 10^{-9} C and -4 x 10^{-9} C are placed at the vertices of an of an equilateral triangle ABC of side 20 cm. calculate the workdone in shifting the charges from A, B and C to A_1, B_1 and C_1 respectively. Which are the mid-points of the sides of triangles?



[J-11]

3. Two positive charges 12 μC and 8 μC respectively are 10 cm apart. Find the workdone in bringing them 4 cm closer, so that they 6 cm apart. [J-08]
4. Two capacitors of unknown capacitances are connected in series and parallel. If the net capacitances in the two combinations are 6μF and 25 μF respectively, find their capacitances. [S-08]
5. The plates of parallel plate capacitor have and area 90 cm^2 each and are separated by 2.5 mm. The capacitor is charged by connecting it into a 400 V supply. How much electrostatic energy is stored by the capacitor? [DPM, J-09]
6. A parallel plate capacitor has an area 200 cm^2 and the separation between the plates is 1 mm. Calculate
   i) the potential difference between the plates if 1 nC charge is given to the capacitor.
   ii) With the same charge (1nC) if the separation is increased to 2 mm, what is the new potential difference and
   iii) the electric field between the plates. [M-06]
7. Three capacitors each of capacitance 9 pF are connected in series
   i) What is the total capacitance of the combination?
   ii) What is the potential difference across each capacitor if the combination is connected to 120 V supply? [J,O-06,J-11]
8. Two capacitors of capacitances 0.5 μF and 0.75 0.5μF are connected in parallel and the combination to 110 V battery. Calculate the charge from the source and the charge on each capacitor. [J-07]

UNIT – 1. Electrostatics – 10 mark Questions

1. What is an electric dipole? Derive an expression for the electric field due to an electric dipole at a point on its axial line. [DPM,M-06,J-06J-08,M-09,11,O-11]
2. Derive an expression for the electric field at a point due to an electric dipole at a point along the equatorial line. [M-07,J-09]
3. Derive an expression for the electric potential at a point due to an electric dipole. Discuss the special cases. [O-06,M-08, J-08,M-10,13]
4. State Gauss law. Using gauss law Obtain the expression for electric field due to an infinitely long straight uniformly charged wire. [J-11,13,M-12]
5. Explain the principle of a capacitor. Obtain the expression for the capacitance of a parallel plate capacitor. [J-12]
6. Deduce an expression for the equivalent capacitance of capacitors connected in 1) series and 2) in parallel. [J-07,S-07]
7. Explain the principle, construction and working of a Van-de Graff generator. [S-08,S-09,S-12]

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