ST.MARY'S HIGHER SECONDARY SCHOOL MULLANKOLLY

Reg. No:..

Name : ....

MODEL HIGHER SECONDARY ANNUAL EXAMINATION, MARCH 2025

HSE(II)   **Maximum : 60 Scores**

PHYSICS   **Time : 2 Hr.**

PART I

Answer any five questions from 1 to 10. Each carries 1 score.   (5 x 1 = 5)

1. How many electrons constitute an electric charge of 16 C?   a) 10^{16} b) 1.6×10^{19} c) 10^{21} d) 10^{20}

2. A device to store electric charge is called---...   a) Transformer   b) Capacitor   c) Inductor   d) Resistor

3. The total capacitance of two 4 µF capacitors when connected in series is ………

4. Kirchoff's first rule is based on conservation of ------ a) Charge b) Energy c) Momentum d) Resistance

5. Resistivity of a conductor depends on.. ..   (a) its material   (b) area   (c) length   (d) all .

6. The electric flux through a closed surface enclosing an electric dipole is ------(a) q/ε (b) $2q/\varepsilon$ (c) 0   (d)$1/\varepsilon$

7. The electric field intensity at a distance r from a uniformly charged infinite plane sheet of charge is proportional to-----

    a) r^2 b) r   c) not proportional to r   d) 1/ r

8. The total charge of an Electric dipole, if one of the charge is q, is --- ------ a) q b) 2q c) 0 d) q/2

9. The SI unit of electric dipole moment is ------   a) m/C   b) $m^2 C$ c) C m   d) C/ m

10. The temperature co-efficient of resistivity of semi conductor is.. …..   a) + ve b) - ve c) 0 d) always constant

PART II

Answer any Five questions from 11 to 18. Each carries 2 scores.   (5 x 2 = 10)

11. A dipole is placed in a uniform electric field. Draw the force acting on each point charge and find the net force on dipole

12. What is the relation connecting electric field and potential difference?

13. State Ohm's law

14. State principle of quantization of electric charge

15. What is electric flux? Give its unit

16. What do you mean by electron volt (eV)? Give its value in Joules

17. Two electric field lines never intersect. Why?

18. State and explain Joule's law of heating

PART III

Answer any three questions from 19 to 25. Each carries 3 scores.   (6 x 3 = 18)
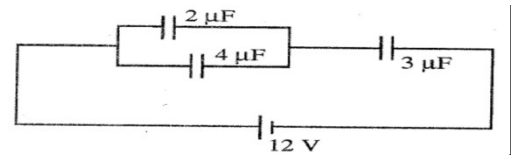
19. What is an electric dipole? Derive the expression for the torque experienced by the dipole in a uniform electric field

20. Derive the expression for electric field intensity at a point on the axial line of an electric dipole.

21. Table given shows the current (I) voltage(V) relationship of a device.

(a) Draw V – I graph. With the help of the graph explain   whether the device is showing Ohmic or non- Ohmic behaviour.

Voltage(V)	1	2	3	4	5	6
Current(I)	10	20	35	50	55	70

   (b) Name two devices which do not obey Ohm's law.

22. State and explain Kirchhoff's junction rule and loop rule.

23.(a) A parallel plate capacitor with air between the plates has a capacitance of $8\mu F$. What will be the capacitance if the distance between the plates is halved and the space between is filled with a medium of dielectric constant 5?

(b) Derive an expression for the energy stored in a capacitor

24. Define drift velocity.Obtain the relation connecting drift velocity and current

25. Three capacitors are connected to a 12 V battery as shown in figure:

(i) What is the effective capacitance of the combination?

(ii) What is the potential difference across the 2 μ F capacitor?

PART IV

Answer any three questions from 26to 30. Each carries 4 scores.　　　　　　**(3 x 4 = 12)**

26. (a) You are given two capacitors having capacitances C_1 and C_2 . Derive an equation for the equivalent capacitance in

(i) Series and (ii) Parallel combinations.

27.(a) Define electric dipole moment (b) Derive the expression for electric field intensity at a point on the equatorial line of an electric dipole.

28.(a)On which factors the resistance of a material depend? (b) Write the relation between resistance and resistivity

(c) A conductor of length 60 cm and area $2x10^{-6}m^2$ has a resistance of 2Ω. Find the resistivity of the material

29.(a)Derive the expression for the capacitance of a parallel plate capacitor.**(b)** What are the factors on which the capacitance of a parallel plate air capacitor depends?

30. (a) What do you meant by equipotential surface?

(b) What is the work done to move a charge Q on the surface of a uniformly charged spherical shell of radius R

(c) Draw the equipotential surface of (a) a single point charge and (b) uniform electric field.

PART V

Answer any three questions from 31 to 35. Each carries 5 scores.　　　　　　**(3 x 5 = 15)**

31. **(a)** Write down the expression for the capacity of a parallel plate air capacitor in terms of plate area and their separation.

(b) Calculate the capacitance of earth. Radius of earth is 6400 km

(c) Raju charged a capacitor and he plotted a graph between changing potential and charge stored in the capacitor. The graph is shown in the figure. What does the area of the shaded portion of the graph represent?
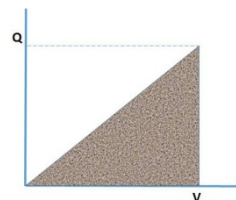
32. (a) Draw circuit diagram off Wheatstone bridge.(b) Obtain the condition for balance of the bridge

33. Define Electrostatic Potential and Potential Difference. Derive an expression for the potential at any point due to an electric dipole in air.

34. **(a)** State Gauss's law in electrostatics (b) Using this law derive an expression for the electric field intensity due to a uniformly charged spherical shell at a point (i) Outside the shell (ii) Inside the shell

35. (a) Which law is used to find the relation between flux and charge ? State the law (b) Using the law find the electric field due to a uniformly charged plane sheet of charge.