

**PSG COLLEGE OF ARTS & SCIENCE**  
(AUTONOMOUS)  
**BSc DEGREE EXAMINATION DECEMBER 2024**  
(Third Semester)

Branch – **PHYSICS**

**ELECTRICITY AND MAGNETISM**

Time: Three Hours

Maximum: 75 Marks

**SECTION-A (10 Marks)**

Answer **ALL** questions

**ALL** questions carry **EQUAL** marks

(10 × 1 = 10)

| Module No. | Question No. | Question                                                                                                                                                                                                                                        | K Level | CO  |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 1            | Choose the appropriate one.<br>If all the points of a surface are the same electric potential, then the surface is called an _____.<br>(a) Electric Potential      (b) Equipotential Surface<br>(c) Potential surface      (d) Electrical force | K1      | CO5 |
|            | 2            | Relate the electric dipole moment developed per unit volume.<br>(a) Electric Potential      (b) Polarization<br>(c) charge density      (d) susceptibility                                                                                      | K2      | CO2 |
| 2          | 3            | Select the unit of current density.<br>(a) A/m <sup>2</sup> (b) A/m      (c) m <sup>2</sup> /A      (d) A                                                                                                                                       | K1      | CO5 |
|            | 4            | Show the network for Thevenin's theorem<br>(a) Linear      (b) both linear and Non linear<br>(c) non Linear      (d) neither Linear nor Non linear.                                                                                             | K2      | CO3 |
| 3          | 5            | Which instrument can be used to compare two E.M.Fs?<br>(a) Galvanometer      (b) Potentiometer<br>(c) Ammeter      (d) Rheostat                                                                                                                 | K1      | CO5 |
|            | 6            | Classify the metal which observe Positive Thomson effect.<br>(a) Zn      (b) Co      (c) Pb      (d) Cu                                                                                                                                         | K2      | CO2 |
| 4          | 7            | Choose the value which is the square root of the average of I <sup>2</sup> during a complete cycle.<br>(a) Peak value      (b) mean value<br>(c) RMS value      (d) virtual value                                                               | K1      | CO5 |
|            | 8            | Relate the Time constant of an RL circuit .<br>(a) $\lambda = 2L / R$ (b) $\lambda = L / R$<br>(c) $\lambda = L / 2R$ (d) $\lambda = R/L$                                                                                                       | K2      | CO2 |
| 5          | 9            | Which of the following material has the highest Permeability?<br>(a) soft Iron      (b) Steel      (c) Perm Alloy      (d) Air                                                                                                                  | K1      | CO5 |
|            | 10           | Relate the law from which ampere's circuital be derived<br>(a) Gauss Law      (b) Newton's Law<br>(c) Kirchhoff's Law      (d) Biot-savart Law                                                                                                  | K2      | CO2 |

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**SECTION - B (35 Marks)**Answer **ALL** questions**ALL** questions carry **EQUAL** Marks (5 × 7 = 35)

| Module No. | Question No. | Question                                                                                                                                                                            | K Level | CO  |
|------------|--------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 11.a.        | Outline the Gauss's Law of Electrostatics.                                                                                                                                          | K2      | CO2 |
|            | (OR)         |                                                                                                                                                                                     |         |     |
|            | 11.b.        | Illustrate the relation between Dielectric constant and Polarization.                                                                                                               |         |     |
| 2          | 12.a.        | Interpret the equation of Continuity.                                                                                                                                               | K2      | CO2 |
|            | (OR)         |                                                                                                                                                                                     |         |     |
|            | 12.b.        | Explain the Superposition Theorem.                                                                                                                                                  |         |     |
| 3          | 13.a.        | Summarize and explain the Faraday's laws of Electrolysis.                                                                                                                           | K2      | CO2 |
|            | (OR)         |                                                                                                                                                                                     |         |     |
|            | 13.b.        | Interpret the expression for Peltier and Thomson Coefficient.                                                                                                                       |         |     |
| 4          | 14.a.        | Evaluate an expression for R.M.S value of an Alternating current.                                                                                                                   | K5      | CO5 |
|            | (OR)         |                                                                                                                                                                                     |         |     |
|            | 14.b.        | Measure the time of leakage. If the charge on a capacitor of capacitance $2\mu\text{F}$ in leaking through a high resistance of 100 mega ohms is reduced to half its maximum value. |         |     |
| 5          | 15.a.        | Prove the relation $B = \mu_0(H+M)$ .                                                                                                                                               | K5      | CO5 |
|            | (OR)         |                                                                                                                                                                                     |         |     |
|            | 15.b.        | Interpret Ampere circuital law and its applications.                                                                                                                                |         |     |

**SECTION - C (30 Marks)**Answer **ANY THREE** questions**ALL** questions carry **EQUAL** Marks (3 × 10 = 30)

| Module No. | Question No. | Question                                                                                                                         | K Level | CO  |
|------------|--------------|----------------------------------------------------------------------------------------------------------------------------------|---------|-----|
| 1          | 16           | Develop Poisson's equation and Laplace equation.                                                                                 | K3      | CO3 |
| 2          | 17           | Explain Norton's network theorem. Show that the Norton's equivalent circuit can be found from the Thevenin's equivalent circuit. | K5      | CO5 |
| 3          | 18           | Show that the Peltier coefficient of a pair of metals is the product of the absolute temperature and Thermoelectric power.       | K2      | CO2 |
| 4          | 19           | Deduct the measurement of high resistance by leakage.                                                                            | K5      | CO5 |
| 5          | 20           | Justify Langevin's theory of<br>i) Diamagnetism ii) Paramagnetism.                                                               | K5      | CO5 |