UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig. .....

Roll No. in Words. .....

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Signature of Supdt.:

PAPER: Classical Electrodynamics-I **MAX. TIME: 15 Min.**

Course Code: PHY-402 Part–I (Compulsory) **MAX. MARKS: 10**

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1. Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)

1. The differential form of Gauss's law is
   a. $\vec{\nabla} \cdot \vec{E} = 0$
   b. $\vec{\nabla} \cdot \vec{E} = \rho/\epsilon_o$
   c. $\vec{\nabla} \times \vec{E} = 0$
   d. $\vec{\nabla} \times \vec{E} = \rho/\epsilon_o$
2. In spherical coordinates, where the φ is a function of one variable only say $\varphi(r)$, then the general solution of Laplace equation becomes
   a. $\varphi(r) = a\,r + b$
   b. $\varphi(r) = a \ln r + b$
   c. $\varphi(r) = -\frac{a}{r} + b$
   d. $\varphi(r) = \frac{a}{r} + b$
3. If the conductivity of a material is extremely low, the electrostatic equilibrium is obtained
   a. extremely rapidly
   b. extremely slowly
   c. In an infinite time
   d. None of these
4. For a homogeneous, isotropic medium characterized by conductivity g and permittivity ϵ, the relaxation time t_c is defined as
   a. $t_c = \epsilon\, g$
   b. $t_c = \epsilon / g$
   c. $t_c = g/\epsilon$
   d. $t_c = \epsilon + g$
5. The magnetic dipole moment of the circuit is
   a. $\frac{1}{2}\oint \vec{r} \times d\vec{l}$
   b. $\oint \vec{r} \times d\vec{l}$
   c. $\frac{1}{2} I \oint \vec{r} \times d\vec{l}$
   d. $I \oint \vec{r} \times d\vec{l}$
6. $\epsilon_o \mu_o$
   a. Has the dimensions of velocity
   b. Has the dimensions of velocity squared
   c. Has a dimensions of an inverse velocity
   d. Has a dimension of an inverse velocity squared
7. The equation which implies that there is no isolated magnetic monopoles
   a. $\vec{\nabla} \cdot \vec{E} = 0$
   b. $\vec{\nabla} \cdot \vec{E} = \rho/\epsilon_o$
   c. $\vec{\nabla} \times \vec{B} = 0$
   d. $\vec{\nabla} \cdot \vec{B} = 0$
8. The magnetic field at a distance "a" due to a long straight current carrying wire is
   a. $B = \frac{\mu_o I}{2a}$
   b. $B = \frac{\mu_o I}{2\pi a}$
   c. $B = \frac{\mu_o I}{2\pi a^3}$
   d. $B = \frac{\mu_o I}{2\pi a^{3/2}}$
9. Since divergence of any curl is zero, it is reasonable to assume that magnetic induction $\vec{B}$ may be written as
   a. $\vec{B} = \vec{\nabla} \times \vec{A}$
   b. $\vec{B} = \vec{\nabla} \cdot \vec{A}$
   c. $\vec{B} = \nabla^2 \vec{A}$
   d. $\vec{B} = \mu_o J$
10. For paramagnetic materials the magnetic susceptibility χ_m is
    a. Negative
    b. Positive
    c. Zero
    d. None of these

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PAPER: Classical Electrodynamics-I
Course Code: PHY-402 Part – II

MAX. TIME: 2 Hrs. 45 Min.
MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2. Explain the short questions. **(5 x 4 = 20)**

1. What are electrostatic images?
2. What is the physical significance of Poisson's equation?
3. Write down Laplace equation in cylindrical and spherical coordinates.
4. What is Poynting vector?
5. Discuss briefly the Lorentz gauge.

Q No. 3 State Biot and Savart Law. Find the expression for magnetic field of a long straight current carrying conductor. (10)

Q No. 4 Derive the relation for equation of continuity. (10)

Q No. 5 Find solution of Laplace equation for an uncharged conducting sphere in an initially uniform electric filed and Find the electric potential and electric field in the region outside the sphere. (10)