**UG (CBCS) EVEN SEMESTER EXAMINATION, 2023**

**EDUCATION (B.Sc. B.Ed.)**

PHYSICS (HONOURS)

6th Semester

Course No. : BSPH - 602

**(Mathematical Physics II, Electricity & Magnetism II)**

Full Marks : 50

Pass Marks : 20

Time : 2 hours

*The figures in the margin indicate full marks for the questions*

1. (a) Evaluate the complex function z if
arg $(z + 1) = 2\pi/5$ and
arg $(z - 1) = 3\pi/4$

(b) If $f(z) = u + iv$ is analytic function, then show that

$$|f'(z)|^2 = \begin{vmatrix} \frac{\partial u}{\partial x} & \frac{\partial u}{\partial y} \\ \frac{\partial v}{\partial x} & \frac{\partial v}{\partial y} \end{vmatrix}$$

(c) Show that Kronecker delta is a tensor of rank z. 4+4+2=10

Or

2. (a) If f (z) in analytic and have constant modelus then show that f (z) is constant.

   (b) Explain the inner multiplication of tensor with example. 6+4=10

3. (a) Derive an expression for the magnetic field at any axial point of a solenoid. Hence calculate its self inductance.

   (b) What is eddy current? 7+3=10

Or

4. (a) Applying Neumann's formula evaluate the mutal inductance between two parallel co-axial circular loops having same area. 10

5. (a) Applying Langevin theory derive an expression for the susceptibility of a diamagnetic material.

   (b) Evaluate the dimension of susceptibility. 8+2=10

Or

6. Applying Langevin theory derive an expression for the susceptibility of a paramagnetic substance. 10

7. Applying Maxwell's equations derive an expression for the
   (a) wave equation for $\overline{H}$.
   (b) wave equation for $\overline{E}$. 5+5=10



Or

8. Derive simplified expression for the energy flux in a plane electromagnetic wave. 10

Or

9. (a) In a time interval t, derive an expression for the energy input to an inductor.

   (b) Derive a relation betwen current-voltage of a series R-L circuit working under a sinusoidal voltagle. Hence explain the phasor diagram. 3+(5+2)=10

10. (a) In a time interval t, derive an expression for energy input to a capacitor

    (b) Derive a relation between current voltage of a series R-C circuit working under sinusoidal voltage. Hence explain the phasor diagram. 3+(5+2)=10

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