2023/EVEN/07/20/BSPP–402/021

UG (CBCS) EVEN SEMESTER EXAMINATION, 2023

EDUCATION (B.Sc. B.Ed.)

PHYSICS (PASS)

4th Semester

Course No. : BSPP - 402

(Magnetism, Heat & Thermodynamics)

Full Marks : 50

Pass Marks : 20

Time : 2 hours

The figures in the margin indicate full marks for the questions

1. (a) Derive an expression for the potential energy of a magnetic dipole placed in a uniform magnetic field.

   (b) Derive an expression for the force on magnetic dipole placed in a non-uniform magnetic field. 4+6=10

Or

2. A cube in formed by joining connecting wires each of resistance R. Calculate the equivalent resistance between

   (a) diagonally opposite corners of the cube

   (b) two corners of the same edge of the cube 5+5=10

3. (a) Derive and expression for the magnetic field due to current in a straight wire of finite length.

   (b) Evaluate an expression for the magnetic field at a pont on the axis of a circular current carrying conductor. 4+6=10

Or

4. (a) Explain the working mechanism of Helmholtz coil.

   (b) Derive an expression for the axial magnetic field of a solenoid. 5+5=10

5. (a) Explain the growth and decay of current in a series RL Circuit.

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

Or

6. (a) Calculate the effective inductance between two coils connnected in series.

   (b) What is coefficient of coupling? 7+3=10

7. (a) Derive an expression for pressure exerted by an ideal gas.

   (b) Derive an expression for mean free path. 7+3=10

Or

8. Applying Maxwell distribution law, derive expression for the following physical parameters.

   (a) Average velocity

   (b) RMS velocity

   (c) Most probable velocity 4+4+2=10

9. (a) Derive an expression for the efficiency of Carnot engine.

   (b) Explain coefficient of performance of a refrigerator. 7+3=10

Or

10. Derive the following Maxwell's relations.

2.5x4=10

(a) $\left(\frac{\partial T}{\partial V}\right)_S = -\left(\frac{\partial P}{\partial S}\right)_V$

(b) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

(c) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$

(d) $-\left(\frac{\partial S}{\partial P}\right)_T = \left(\frac{\partial V}{\partial T}\right)_P$

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