BACHELOR OF SCIENCE EXAMINATION, 2019 (OLD)
(2nd Year, 1st Semester)
Physics (Subsidiary)
Paper-SO5

Time: 2 Hours

Full Marks: 50

Answer any *five* questions.

1. a) State the Gauss's law in electrostatics (in vacuum). How is the law modified in presence of a dielectric medium?

   b) What is dielectric polarization? Define polar and non-polar molecules. Give an example for each type of molecules.   5+5=10

2. a) Distinguish between para, dia and ferro magnetic materials.

   b) What do you mean by hysteresis? What type of materials are used in electromagnet and transfer core and why?   5+5=10

3. a) What is mutual inductance? Calculate mutual inductance between two solenoids.

   b) Show that the electromagnetic energy due to a current i in a circuit is given by $W=\frac{1}{2}Li^2$
                                                                               5+5=10

4. a) Discuss the theory of charging a capacitor through a resistance.

   b) A condenser of capacitance 10 μF is charged to a potential 100V. On connecting it across an unknown resistance (R), the voltage is found to fall to 67 V in 40 sec. What is the value of R?   5+5=10

5. a) A sinusoidal current is given by $i(t) = I_0 \, Sin\omega t$. Find out the r.m.s. and average value of the current. What is form factor?

   b) Write down Maxwell's electromagnetic equations. Mention the physical laws from which these equations have been derived.   5+5=10

6. a) What do you mean by resonance in a series L-C-R circuit. Find the expression for the resonant frequency in that circuit.

   b) A series L-C-R circuit has L= 200 μH, C= 50 pF and R= 10 ohm. Determine the resonant frequency of the circuit.   6+4=10

7. Write notes on any two (5x2)

   a) L-R circuit with an a.c. source

   b) Ampere's circuital law

   c) Cylindrical condenser