**PHY125**

**Tutorial sheet on Unit 4**

1. Find the electric field at a point (x,y,z) if the potential at that point is V = *xyz*.
2. Two particles A and B having charges 8 µC and – 2 µC respectively are held fixed with a separation of 20 cm. Where should a third charged particle be placed so that it does not experience a net electric force? *Ans: 20 cm* (where?)
3. The potential at a certain distance from a point charge is 600 volts and the electric field is 200 newton/coulomb. What is the distance of the point charge? What is the magnitude of the charge? Ans: *3m, 0.2 micro C*
4. Consider a circular conducting loop of radius r=0.20 m placed in a uniform magnetic field B directed out of the page having magnitude B = 4.0 t2 + 2.0 t + 3.0, with B in Tesla and t in seconds. What is the magnitude and direction of the induced emf at t=10s?
5. A long solenoid of diameter 5 cm has 100 turns per cm of its length. At the center of the solenoid, a small coil of 50 turns and 2 cm diameter is placed such that the magnetic field produced by the solenoid is parallel to the axis of the coil. The current in the solenoid is changed from 2 A to zero and then raised to 2 A in the opposite direction at a steady rate over a period of 0.1 s. Calculate the emf induced in the coil during this change.
6. A vertical copper disc of diameter 20 cm makes 10 revolutions per second about a horizontal axis passing through its centre. A uniform magnetic field of 100 gauss acts perpendicular to the plane of the disc. Calculate the potential difference between its centre and rim in volts.
7. A 10 cm long wire carrying a current of 10 amp is held at an angle of 30 degree with the direction of a uniform magnetic field of strength 1 weber/m2. Calculate the force acting on the wire.
8. A current of 10 amp flows in each of the two conducting wires parallel to each other. The separation between the wires is 2 cm. Find the force per unit length of one of the wires.
9. A solenoid, 1 meter long and 3 cm in diameter, carries a current of 5.00 amp. It has 5 layers of windings having 850 turns in each layer. Calculate B at its center.
10. Suppose that the electric field amplitude of an electromagnetic wave is *E0*= 120 N/C, and that its frequency is ν = 50 MHz. (a) Determine *B0​*, *ω*, *k* and *λ* (b) Find expressions for *E* and *B*.