Indian Institute of Technology, Delhi Department of Physics Electromagnetics

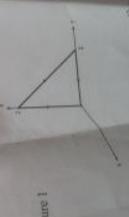
1" Semester 2013-2014 EPL107-

anon: I hour

Date: 02 Aug. 2013 Marks: 20

(a) Given that $F = xy\hat{x} + 2yz\hat{y} + 3xz\hat{x}$, calculate the circulation of F around the closed path shown in Figure 1.

- (b) Positive charge Q is distributed uniformly along the positive x-axis from x = 0 to x = a. A positive charge q is located on the same axis at x = a + r, (i) Calculate the electric field produced by the charge distribution Q at points on axis for x > a, (ii) Calculate the force that the charge distribution Q exerts on q. (iii) What happens when r >> a.
 - (c) A vacuum diode consists of a cylindrical cathode with radius 0.062 cm, mounted coaxially within a cylindrical anode 0.557 cm in radius. The potential of anode is 360 V higher than the cathode. An electron leaves the surface of cathode with zero initial speed. Find its speed when it strikes the anode?
- concentric copper rube of inner radius c. The space between is partially filled from b out to surrounded by (i) A certain coaxial cable consists of a solid copper wire, radius a,
 - c) with material of dielectric constant x. Find the capacitance per unit length of this cable.
- (5+3) (ii) A conducting sphere of radius R carries a charge Q. Calculate the total energy stored in the surrounding space. What happens in the limit $R \to 0 7$
- A very long cylinder of linear dielectric material (radius a, susceptibility g,) is placed in an otherwise uniform electric field Eo, with the axis perpendicular to Eo. Find the resulting
 - field within the cylinder.



c-1.60×10-19 C Constants

- 9.11 × 10²¹ Kg

Ep = 8.85 × 10⁴⁷