The Open University of Sri Lanka
B.Sc/B.Ed Degree Programme
Closed Book Test (CBT) 2010/2011
Level 05 - Applied Mathematics
AMU 3185/AME 5185 – EM Theory & Special Relativity

Duration :- One and half hours.

Date :-06-04-2010. **Time:- 4.00 p.m. – 5.30 p.m.**

Answer All Questions

01. State Biot–Savart's law for steady currents.
A cable AB of length l of uniform wire develops a leak at a certain point P through which current leaks to earth. To locate the fault two observations are made. The resistance between A and the earth through the cable when B is earthed is observed to be that of a length a of the wire, and that between B and the earth when A is earthed to be that of a length b. Show that the point P intersects AB in the ratio $\left[\frac{a(l-b)}{b(l-a)}\right]^{1/2}$, and find the resistance of the leak as a measure of the length of the wire.

02. (a) Define the following terms.
(i) Resistivity (ii) Flux density
(ii) Charge density (iv) Potential

(b) A uniform volume charge distribution of -10^{-8} coulomb/(metre)^3 occupies the region between two co-axial conducting cylinders of radii 20 *mm* and 50 *mm*. If the electric field and potential are both zero on the inner cylinder, find the potential on the outer cylinder.
(Hint: Use the Poisson's equation.)

03. State Kirchoff's law.
Figure shows a capacitor C, initially uncharged, that is connected at time $t=0$ to a voltage source V through a resistor R.
Find the voltage across the capacitor by using Kirchoff's law.