

SCT 253-1 Applied Electricity

Number of questions: Three (03)

Answer all questions

Time allocation: One (01) hours

Total marks allocated: 100

1. State the Amperes law in electromagnetism.

A long coaxial cable consists of two concentric conductors with the dimensions shown in Fig.1. There are equal and opposite currents i in the conductors.

- (i) Determine the magnetic field $B(r)$ at distance r from the axis for

- (a). $r < a$ (within the inner conductor),
- (b). $a < r < b$ (between the two conductors),
- (c). $b < r < c$ (within the outer conductor),
- (d). $r > c$ (outside the cable)

- (ii) Sketch the variation of $B(r)$ from $r = 0$ to $r \rightarrow \infty$

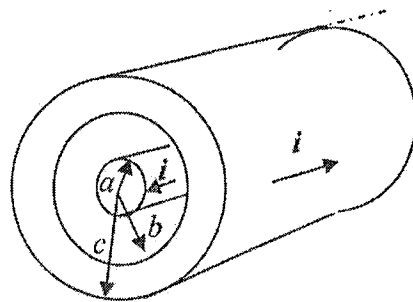


Fig.1

(30 marks)

2. A long solenoid with an air core has $n_1=100$ turns per meter and a cross-sectional area of $A_1=10\text{cm}^2$. The current I_1 flowing around the solenoid increases from 0 to 50A in 2.0s. A plane loop of wire consisting of $N_2=10$ turns, which is of cross-sectional area $A_2=100\text{cm}^2$ and resistance $R_2=0.050\Omega$, is placed around the solenoid close to its centre. The loop is orientated such that it lies in the plane perpendicular to the axis of the solenoid. What is the magnitude E_2 of the emf induced in the coil? What current I_2 does this emf drive around the coil? Does this current circulate in the same direction as the current flowing in the solenoid, or in the opposite direction?

(40 marks)

3. Discuss the importance of using high voltage (kV) power line, when transmitting power to long distance from the power generator.

Electric power is supplied by a power house for a certain town by using a single-phase 220V AC, two wire system. When the demand is maximum, the voltage supplied to the town drops to 170V. Show that the voltage supplied to the town always remains more than 215V by replacing 220V supply to 11kV high voltage, using the same conductors.

(30 marks)

