**St Clements University Higher Education School Niue**

**High light Computer Group**

**Bachelor of Applied Engineering Electrical**

**BAE 407 Advanced Electro-magnetics Field & Materials**

**(Each 10 marks Total 100 Marks)**

Q1

IF $\vec{A} = 2i - 3j + 4k$ & $\vec{B} = -4i - 2j + 5k$

Q2

A CHARGE $3\times10^{-4}$ C AT P(1, 2, 3) AND A CHARGE $-10^{-4}$ AT Q (2, 0, 5) FIND FORCE

Q3

$V_m$ - SOURCE = 2000 AT, CSA = 6 $cm^2$, TURNS = 500
MEAN RADIUS = 15cm I = 4A. FIND H.

Q4

Pa FIND $\bar{D}$ AT P = (3, -4, 5) (i) BY A POINT CHARGE AT 0.2μC AT ORIGIN. (ii) LINE CHARGE 30mC/m AT Z-AXIS
(iii) SURFACE CHARGE 0.7π (x = 5)

Q5

Pb FIND $\bar{E}$ AT 2, 0, 2 BY SHEET CHARGE
(i) x = 0 $\rho_{s1} = \frac{1}{3\pi}$ nC/$m^2$
(ii) SHEET AT x = 4m WITH $\rho_{sL} = \frac{1}{3\pi}$ nC/$cm^2$
(iii) LINE AT x = 6m y = 0 $\rho_e = -2$nC/m

Q6

LINE CHARGE LIES IN $x = -3$, $3 = 4$. FIND $\overline{E}$ AT $P_2(4,0,2)$

$\rho_L = 25 mC/m$

Q7

Figure 3.3 shows the arrangement of a pinch resistor in an integrated circuit. If the p regions (shown shaded) are earthed and the n region is always positive, the two p-n junctions are reverse biased. A layer of the n region adjacent to each junction is depleted of conduction electrons and is, effectively, an insulator. The thickness of the depletion layer is given by

$$t = a\sqrt{\frac{V + V_{GS}}{V_p}} \qquad (3.12)$$

where $V_p$ is a constant and $V$ is the local potential in the channel referred to $S$. Given that the n channel has width $w$ (into the page) and its other dimensions are as shown in Fig. 3.3 find expressions for the current in the channel:

a) when the current through the resistor is small, so that the voltage $V_{DS}$ is much less than $V_{GS}$, and
b) when the current through the resistor is not small.

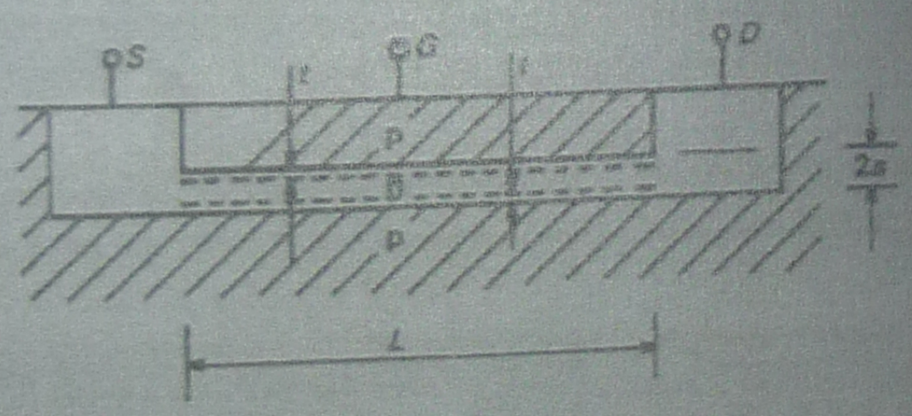


Fig. 3.3 Arrangement of a pinch resistor for an integrated circuit.

Q8

WRITE THE EQUATIONS

(a) FORCE ON MOVING CHARGE

(b) FORCE ON MOVING PARTICLE DUE TO COMBINED ELECTRIC FIELD AND MAGNETIC FIELD

Q9

FIND THE EQUATION FOR STEADY MAGNETIC FIELD

Q10

WRITE THE EQUATION TO DETERMINE Curl H