6. DC's & DR's

1 x 7 = 7 Marks

IMP FORMULAS, KEY CONCEPTS

1) Direction cosines of a line:

If a directed line makes angles α, β, γ with the 3 coordinate axes then $(\cos\alpha, \cos\beta, \cos\gamma)$ are called the direction cosines (d.c's) of the line and these are denoted by (l, m, n) i.e., $l = \cos\alpha$, $m = \cos\beta$, $n = \cos\gamma$

2) If l,m,n are d.c's of a line then $l^2 + m^2 + n^2 = 1$

3) The d.c's of the line joining $A(x_1, y_1, z_1)$, $B(x_2, y_2, z_2)$ are $\pm\left(\frac{x_1 - x_2}{AB}, \frac{y_1 - y_2}{AB}, \frac{z_1 - z_2}{AB}\right)$

4) Direction ratios of a line:

An ordered triple of numbers which are proportional to the d.c's of a line, is called the 'direction ratios' (d.r's) of that line i.e., if $l : m : n = a : b : c$ then (a,b,c) are the d.r's of the line.

If (a, b, c) are the d.r's of a line and k is a non zero real number then (ka, kb, kc) are also direction ratios of the line.

5) The d.r's of the line joining $A(x_1, y_1, z_1)$, $B(x_2, y_2, z_2)$ are $(x_1 - x_2, y_1 - y_2, z_1 - z_2)$.

6) If (a, b, c) are direction ratios of a ray then the direction cosines of the ray are

$$\left(\frac{a}{\sqrt{a^2+b^2+c^2}}, \frac{b}{\sqrt{a^2+b^2+c^2}}, \frac{c}{\sqrt{a^2+b^2+c^2}}\right)$$

7) If θ is the angle between 2 lines with d.r's (a_1, b_1, c_1),(a_2, b_2, c_2) then

$$\cos\theta = \left(\frac{a_1a_2 + b_1b_2 + c_1c_2}{\sqrt{(a_1^2 + b_1^2 + c_1^2)(a_2^2 + b_2^2 + c_2^2)}}\right)$$

8) Two lines with d.r's (a_1, b_1, c_1) and (a_2, b_2, c_2) are perpendicular if $a_1a_2 + b_1b_2 + c_1c_2 = 0$