Date :
Page No. :

Dirac Notation Property :-

OR

Ket - Bra vectors properties :-

Space vector is independent of representation of but component depend on "

eg. $\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$

$= ()\hat{r} + ()\hat{\theta} + ()\hat{\phi}$

$= ()\hat{s} + ()\hat{\phi} + ()\hat{z}$

In Sch^n rep^n → state is represented by sca

but In Dirac rep^n → " " " vect

In dirac rep^n, unit vectors rep^n basis

for a vector, there may be ∞ no. of ba

Vector will be basis vector if they satisfy t

orthonormality cond^n i.e.

$\hat{i}\cdot\hat{i} = 1$, $\hat{i}\cdot\hat{j} = 0$, $\hat{i}\cdot\hat{k} = 0$

If 2 state vectors $|\phi_1\rangle$ & $|\phi_2\rangle$ then

⇒ If they have some relationship then by chan ϕ_1 ⇒ ϕ_2 will be change so the relation rem same.

relation ⇒ $|\phi_1\rangle + 2|\phi_2\rangle = 0$

Then these vectors are Linearly dependent vect

⇒ But In Linearly Independent → No relation b/w state vecto

⇒ Consider a linear combination of state

$|\phi_1\rangle, |\phi_2 \; ----- \; |\phi_n$

$\sum_n C_n|\phi_n\rangle = 0$

⇒ If $C_n = 0$ ⇒ Linearly dependent

$C_n \neq 0$ ⇒ Linearly Independent

for Ex → If we have 10 vectors & $C_1 = C_3 \neq 0$ 4

all other 0 then ~~2~~ vectors corresponding to $C_1 \cdot C_3$ → L.

⇒ Corresponding to this, vector form by its hermitian conjugate (Hermitian Conj. of bra vector → ket vector) will rep^n the Dual Space.

Properties

(In case of vector we take $+$ in place of $*$ (scalar).

1) $\langle\psi| = (|\psi\rangle)^+$

2) $\boxed{|a\psi\rangle = a|\psi\rangle}$

$\langle a\psi| = ?$

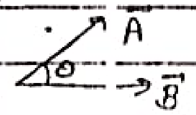
$(|a\psi\rangle)^+ = (a|\psi\rangle)^+$

$\boxed{\langle a\psi| = \langle\psi|a^*}$

3) $(\langle\psi|\psi\rangle)^{1/2} =$ Norm or length of vector

4) $\langle\phi|\psi\rangle =$ projection of 1 vector along the dir^n of other vector.

→ Scalar product of 2-state vectors.



$A \cdot B = |A|\underbrace{|B|\cos\theta}_{\text{Projection}}$

(5) $|\psi\rangle = \sum_n C_n|\phi_n\rangle$

Vector Product → If we take cross product of $|\phi\rangle$ $|\psi\rangle$ then

→ If both vectors belong to same vector space then vector product will be forbidden.

→ But if both vectors belong to ~~same~~ different vector space then product will be allowed.

e.g. $|\psi\rangle = |\psi\rangle_{space}$, $|\psi\rangle_{orb}$, $|\psi\rangle_{spin}$, $|\psi\rangle_{isospin}$