FEYNMAN DIAGRAMS :-

When physical problems are solved, the interaction between two fields is considered which is taken as a coupling between fields by means of coupling constant (1)

ex:→ if Electrons $\xrightarrow{\text{interaction}}$ photons

then Direc field $\xrightarrow{\text{coupling}}$ E.M. field. is studied

To treat such coupled fields several techniques are employed, of which Fynman diagram is one of the very useful technique.

These are the graphical representation of certain scattering processes in connection with the interaction of E.M. fields with charges.

These diagrams proved to be very useful in the pictürisation and in the interpretation of the complex mathematics underlying scattering theory.

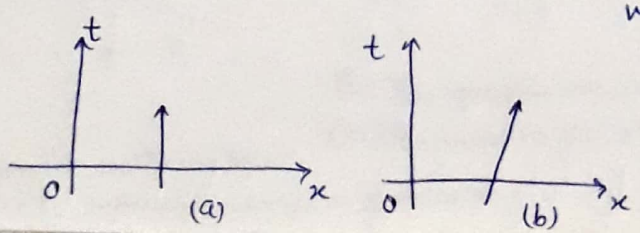
Notification to draw Feynman diagram :-

(i) Space axis is denoted by "x" and time axis is denoted by "t". Both these axis are perpendicular to each other.

(ii) Time axis runs vertically upwards and space coordinate increases from left to right.

(iii) An electron (fermion) is represented graphically by a solid line pointing forward in time, and a positron (anti-fermion) pointing backward in time.

If the e^- is at rest the graphical representation will be a line parallel to 't' axis fig(a) and if the e^- is in uniform velocity it can be represented by inclined line as shown in fig.(b).



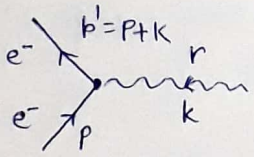
A photon is represented by a wave line. other bosons are represented by dotted lines.

Rules to follow:- **FD$_1$:-** A solid line ending at the vertex represents either antilation (or absorption) of an e^- or creation (emission) of a positron.

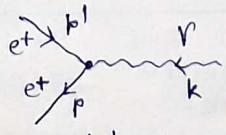
Similarly a solid line beginning at the vertex denotes either creation of an e^- or annihilation of a positron.

FD$_2$:- The no. of fermion ending at the vertex is equal to the no. of fermion lines beginning at the vertex (conservations of fermions no.). Following a fermion line through the vertex, the arrow always points in the same sense.

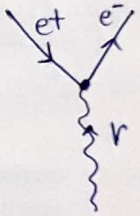
The following diagrams are important



electron scattering
(c)



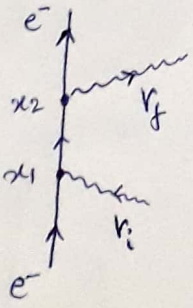
photon or positron scattering
(d)



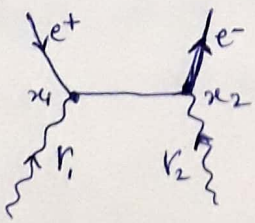
pair creation
(e)

pair annihilation
(f)

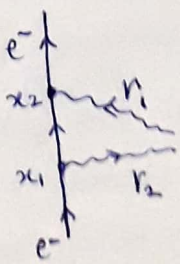
Diagrams c, d, e and f are known as "Basic vertex parts". There doesnot necessarily corresponds to actual physical process.



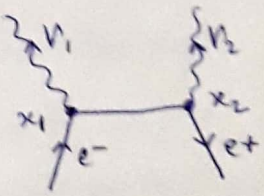
(g) compton scattering by e^-s.
[$t_1 < t_2$ represents absorption of photon by e^- at x_1]



(h) Two quantum pair creation
[$t_1 > t_2$. creation of e^-, e^+ pair at x_2 with emission of photon]



(i) compton scattering by e^-'s.



(j) Two quantum pair annihilation

above (4) figs. corresponds to actual physical process obtained by combining two or more basic vertex parts.