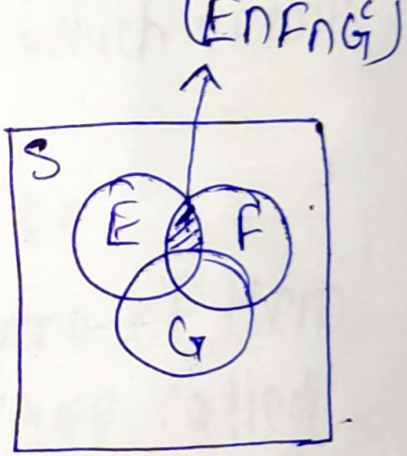
4. a, b, P(F)

$$P(E \cup F \cup G) = P(E) + P(F) + P(G) - P(E \cap F) - P(F \cap G) - P(G \cap E) + P(E \cap F \cap G)$$

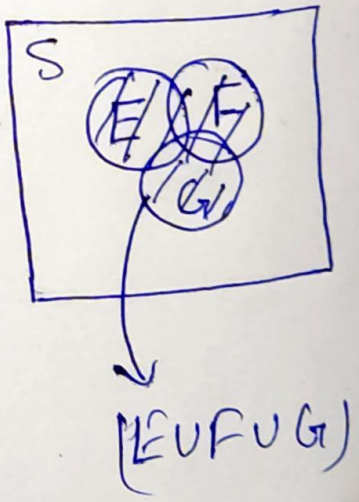
(a) $$P(F) = P(E \cup F \cup G) - P(E) - P(G) + P(E \cap F) + P(F \cap G) + P(G \cap E) - P(E \cap F \cap G)$$

(b) $$P(E \cap F \cap G^c) = P(E \cap F) - P(E \cap F \cap G)$$



(c) <u>At least one event occurs</u> :—

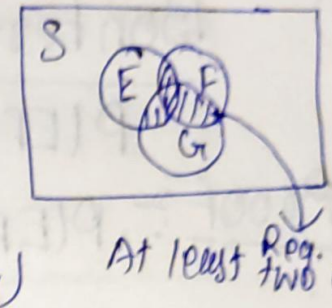
$$P(E \cup F \cup G) = P(S) - P(E^c \cap F^c \cap G^c)$$



(d) At least two events occur :-

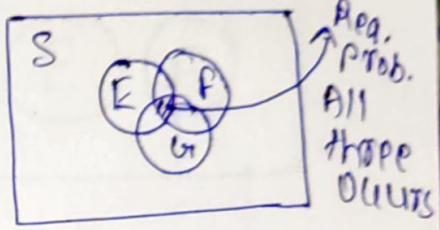
Required probability =

$$P(E \cap F) + P(E \cap G) + P(G \cap F) - 2P(E \cap F \cap G)$$



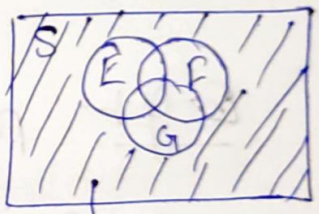
(e) All three events :-

Req. prob. = $P(E \cap F \cap G)$



(f) None occurs :-

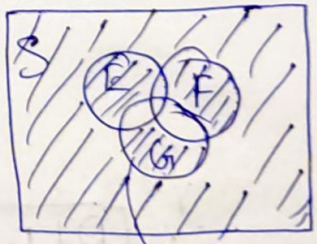
Req. prob. = $P(E^c \cap F^c \cap G^c) = P(S) - P(E \cup F \cup G)$



(g) At most one occurs :-

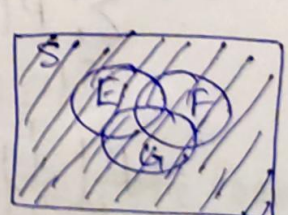
Req. prob. = $P(E) - P(E \cap F) - P(E \cap G) + P(E \cap F \cap G) + P(F) - P(E \cap F) - P(F \cap G) + P(E \cap F \cap G) + P(G) - P(E \cap G) - P(G \cap F) + P(E \cap F \cap G) + P(S) - P(E \cup F \cup G)$

$= P(E) + P(F) + P(G) - 2P(E \cap F) - 2P(F \cap G) - 2P(G \cap E) + 3P(E \cap F \cap G) + P(S) - P(E \cup F \cup G)$



(h) At most two occur :-

Req. prob. = $P(S) - P(E \cap F \cap G)$



Consider L.H.S :-