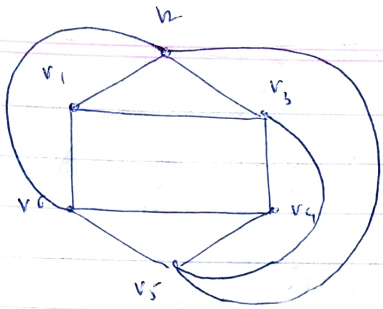
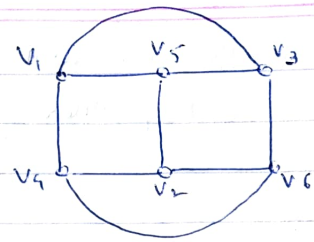
$\Rightarrow$

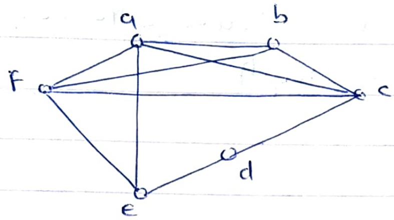


G_1

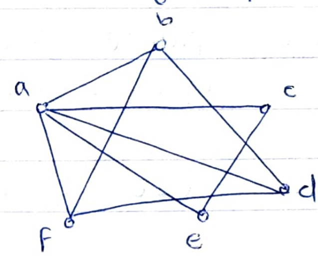


G_2

Ex. ② Draw the planner representation of Graph G_3 & G_4

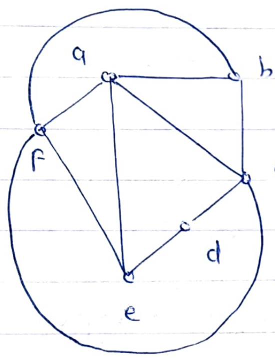


G_3

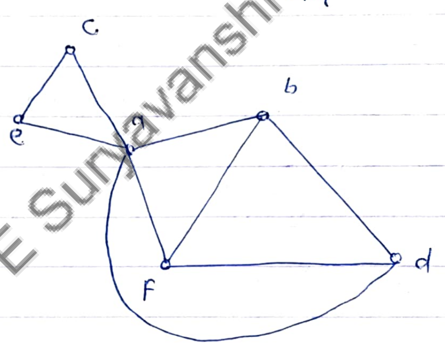


G_4

$\Rightarrow$

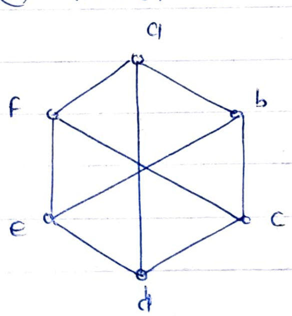


G_3

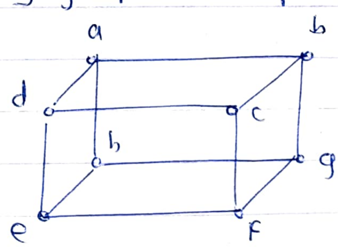


G_4

Ex. ③ Which of the following graphs are planner?



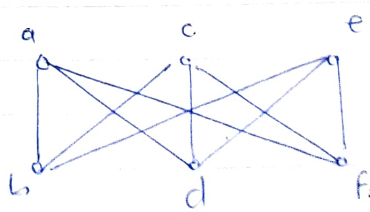
G_5



G_6

$\Rightarrow$

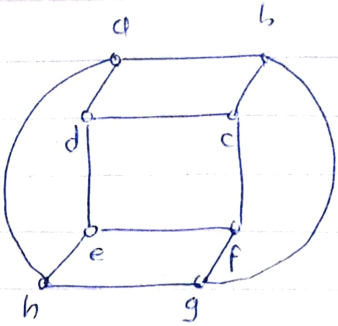
G_5 is a kuratowski's second graph $K_{3,3}$ & it can be drawn as $\rightarrow$



Hence it is non-planner graph

G_6 can be re-drawn as →

Hence G_6 is planner graph



G_6

- Ex ④ Determine the no. of regions defined by a connected planner graph with 6-nodes & 10 edges. Draw simple & non-simple graph.

⇒

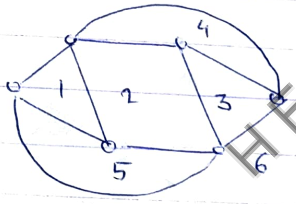
Given $\quad V=6 \quad \& \quad e=10$

$\therefore \quad V-e+r=2$

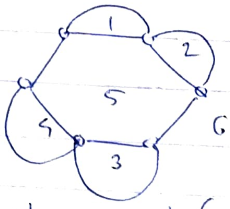
$6-10+r=2$

$\therefore \quad r=6$

Hence graph should have 6-regions



Simple graph



Non-simple (Multiple) Graph

- Ex ⑤ How many edges must a planner graph have if it has 7 regions & 5 nodes. Draw one such graph.

⇒

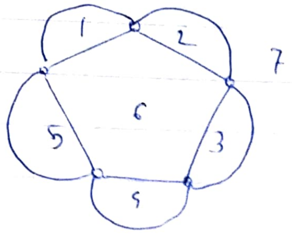
Given $\quad V=5, \; r=7$

$V-e+r=2$

$5-e+7=2$

$e=10$

Hence, graph have 10 edges



Ex ⑥ A connected planner graph has nine vertices having degrees 2, 2, 2, 3, 3, 3, 4, 4, & 5. How many edges are there? How many faces (regions) are there?

⇒ By Handshaking lemma

$$\sum_{i=1}^{n} d(v_i) = 2e$$

$$2+2+2+3+3+3+4+4+5 = 2e$$

$$28 = 2e$$

$$\therefore \boxed{e = 14}$$

∴ Total edges = 14

By Eulers Formula

$$v - e + r = 2$$

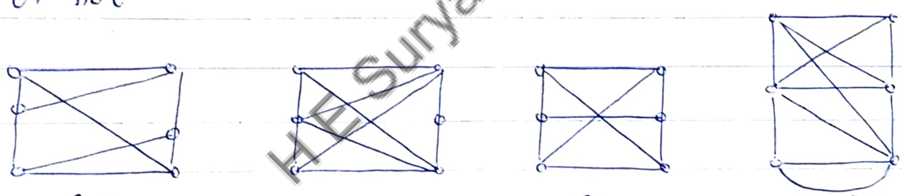
Here $v = 9$, $e = 14$

$$\therefore 9 - 14 + r = 2$$

$$\boxed{r = 7}$$

∴ Total regions (faces) = 7

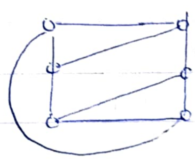
Ex (7) Identify whether the graphs given are planner or not



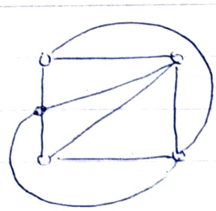
G1 G2 G3 G4

⇒

G1 planner Graph ⇒

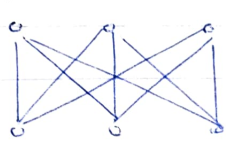


G2 planner Graph ⇒



G3 Non-planner Graph

It's kuratowskis graph $K_{3,3}$ ⇒



G4 planner Graph ⇒