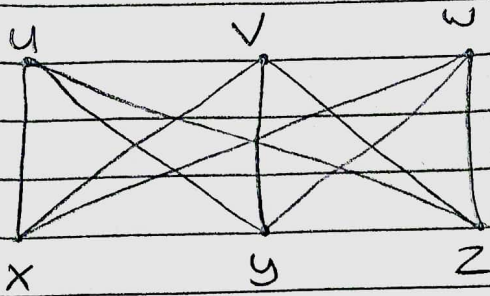


① write down each graph The vertex set and edge set.

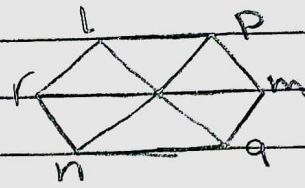


$$V(G) = \{u, v, w, x, y, z\}$$

$$|V(G)| = 6 \quad (\text{order of } G)$$

$$|E(G)| = 9 \quad (\text{Size})$$

$$E(G) = \{ux, uy, uz, vx, vy, vz, wx, wy, wz\}$$



$$V(G) = \{r, n, q, m, p, l\}$$

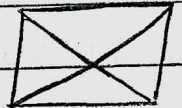
$$E(G) = \{lp, pn, pm, mq, nq, nr, rl, mr, ql\}$$

Path

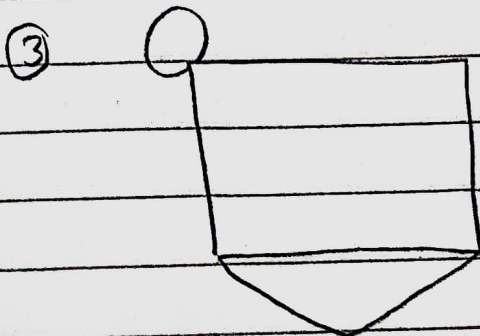
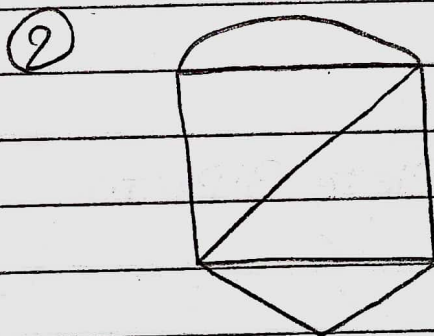
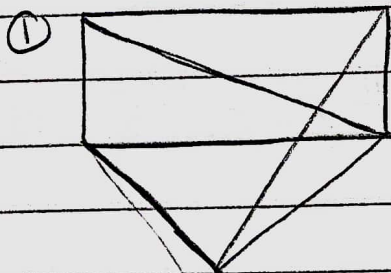
Cycle

Complete

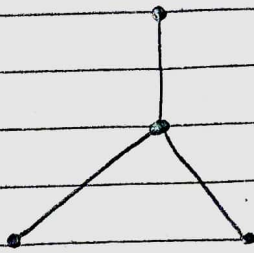
graph  $K_n$



② draw a simple<sup>①</sup> graph, non simple<sup>②</sup> graph with no loop, non simple graph with<sup>③</sup> no multi-edges → 5 vertices - 8 edges



③ write down The degree sequence of each graph with Four Vertices

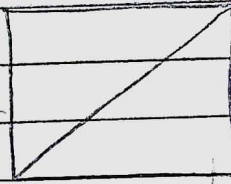


$(3, 1, 1, 1)$

Sum = 6 (even)

$\Delta(G) = 3$  (max.)

$\delta(G) = 1$  (min.)

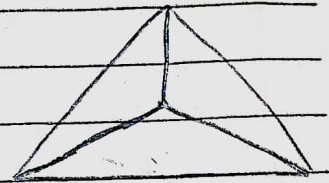


$(3, 3, 2, 2)$

Sum = 10 (even)

$\Delta(G) = 3$

$\delta(G) = 2$



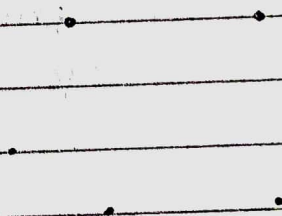
regular graph

$(3, 3, 3, 3)$

Sum = 12

④ Draw The Following graph

① null graph ( $N_5$ )

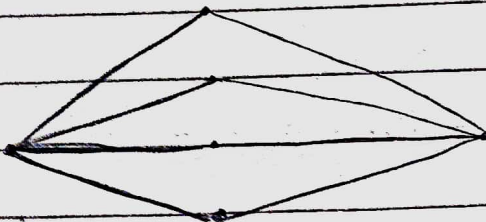


② Complete graph  $K_6$



$$E = \frac{n(n-1)}{2} = \frac{6(5)}{2} = 15$$

③  $K_{2,4}$  Complete Bipartite  
(a, b)



$$E = a \times b = 2 \times 4 = 8$$

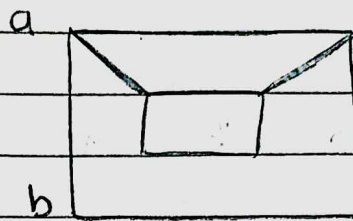
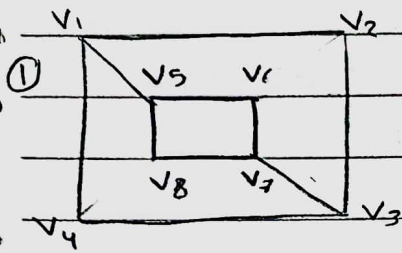


⑤ How many edges has each of following graph

①  $K_{10} = \frac{10(9)}{2} = 45$

$K_{5,7} = 5(7) = 35$

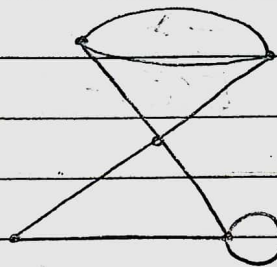
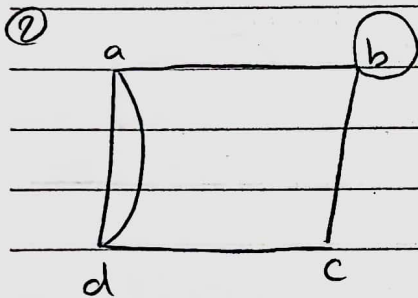
⑥ Isomorphic or not:



$F(v_1) = a$

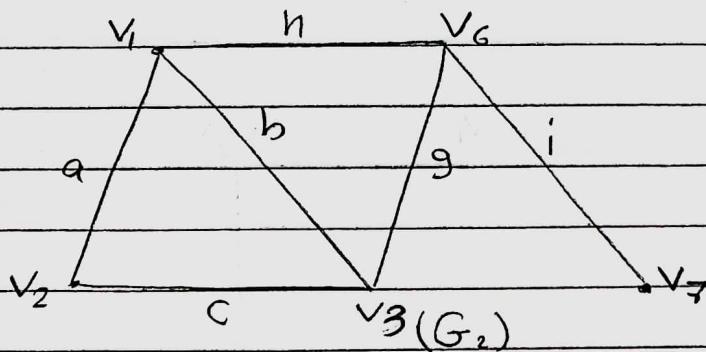
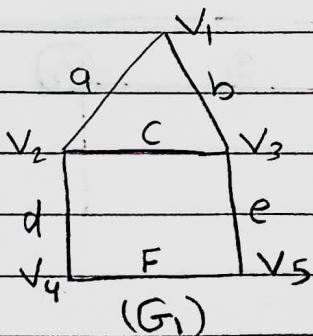
$F(v_4) = b$

Non Isomorphic



Isomorphic

⑦ Let  $G_1, G_2$  be any two graph Then union, intersection and ring some of these graph are?



$V(G_1) = \{v_1, v_2, v_3, v_4, v_5\}$  ,  $V(G_2) = \{v_1, v_2, v_3, v_6, v_7\}$

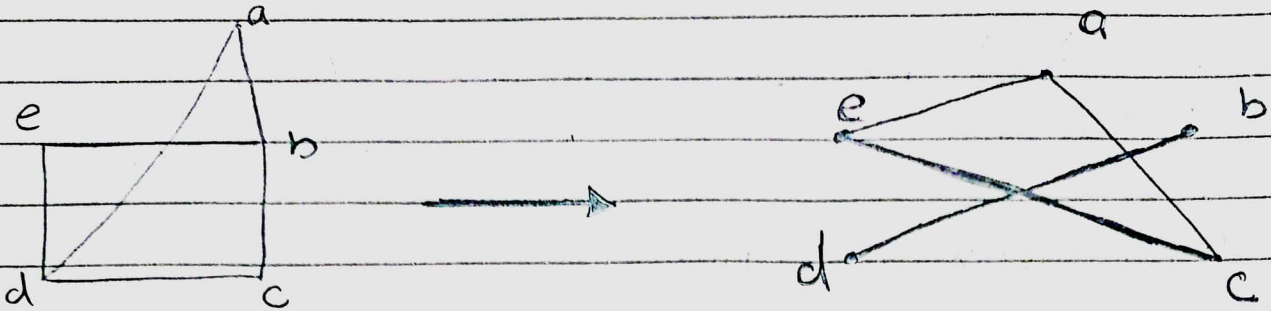
$E(G_1) = \{a, b, c, d, e, f\}$  ,  $E(G_2) = \{a, b, c, h, g, i\}$

①  $V(G_1 \cup G_2) = \{v_1, v_2, v_3, v_4, v_5, v_6, v_7\}$  ,  $E(G_1 \cup G_2) = \{a, b, c, d, e, f, g, h, i\}$

②  $V(G_1 \cap G_2) = \{v_1, v_2, v_3\}$  ,  $E(G_1 \cap G_2) = \{a, b, c\}$

③  $(G_1 \oplus G_2) = \{G_1 \cup G_2\} - \{G_1 \cap G_2\}$

## ⑧ Complement



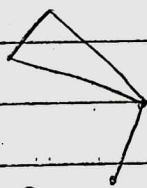
⑨ let  $(G)$  be a simple graph with 9 vertices and 12 edges Find the no. of edge in  $(\bar{G})$

$$V = 9 \quad \leftarrow (G) \rightarrow E = 12$$

$$\textcircled{1} E(G) + E(\bar{G}) = E(K_n) \rightarrow E(G) + E(\bar{G}) = \frac{n(n-1)}{2}$$

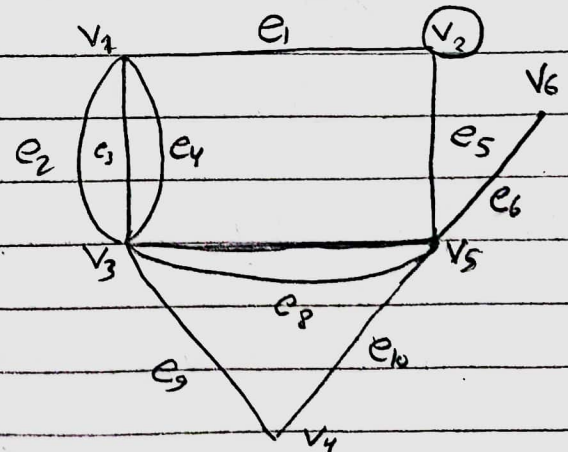
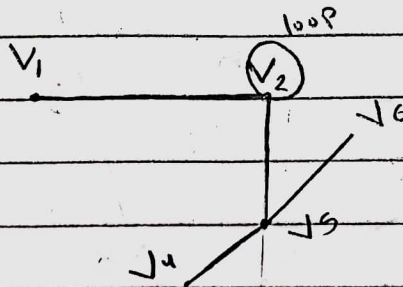
$$E(\bar{G}) = 24$$

Join

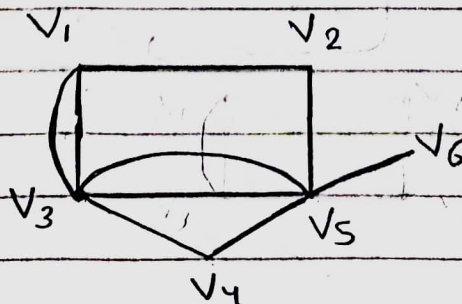
 $G_1$  $G_2$  $G_1 + G_2$ 

⑩

$$\textcircled{1} G - v_3 \rightarrow$$

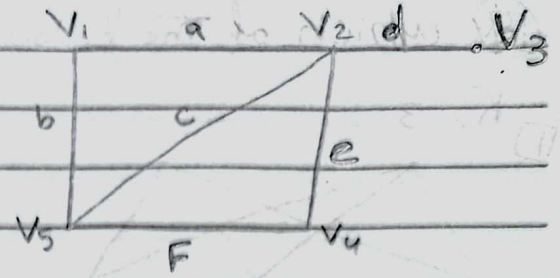
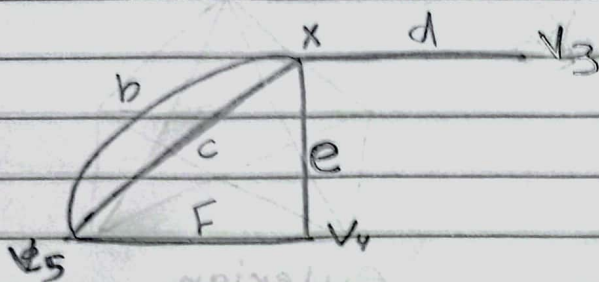


$$\textcircled{2} G - e_3$$



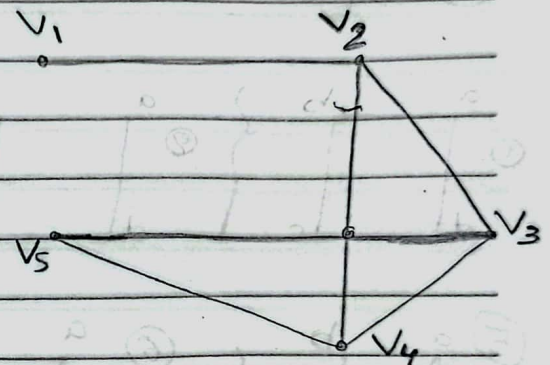


⑪ Fused  $V_1$  with  $V_2$



⑫ Find eccentricity and radius and diameter of a graph

$n$	$V_1$	$V_2$	$V_3$	$V_4$	$V_5$	$E$
$V_1$	0	1	2	2	3	3
$V_2$	1	0	1	1	2	2
$V_3$	2	1	0	1	1	2
$V_4$	2	1	1	0	1	2
$V_5$	3	2	1	1	0	3

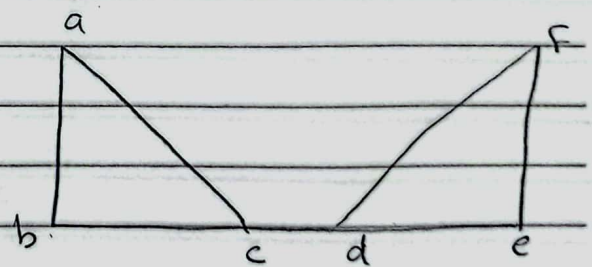


$$r(\min E) = 2, \quad d(\max E) = 3$$

$$\text{Center } (= r) = V_2, V_3, V_4$$

⑬

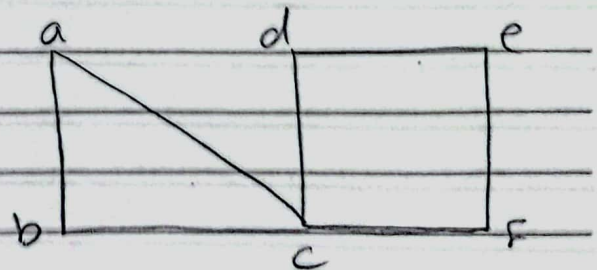
① Cut vertex:  $c, d$   
Cut edge:  $CD$



②

cut vertex =  $c$

no cut edges



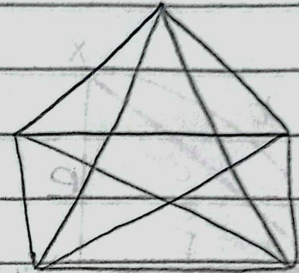
⑭ which of the following graphs are Eulerian? semi-Eulerian

①  $K_{2,3}$



Semi-eulerian

②  $K_5$



Eulerian

⑮ Draw all the spanning trees in the graph of

