1) Write the adjacency and incidence matrix for the following graph

G_1

	V_1	V_2	V_3	V_4	V_5	V_6
V_1	0	1	0	1	1	0
V_2	1	0	1	1	0	0
V_3	0	1	0	0	0	0
V_4	1	1	0	0	1	0
V_5	1	0	0	1	0	0
V_6	0	0	0	1	0	0

G_2

	V_1	V_2	V_3	V_4
V_1	0	1	1	0
V_2	1	0	1	0
V_3	1	1	0	1
V_4	0	0	1	0

G_3

	V_1	V_2	V_3	V_4
V_1	0	1	0	1
V_2	1	0	0	1
V_3	0	0	0	1
V_4	1	1	1	0

Incidence matrix

G_1

	e_1	e_2	e_3	e_4	e_5	e_6	e_7	e_8
V_1	0	0	0	1	0	1	1	0
V_2	0	0	0	0	1	1	0	1
V_3	0	0	0	0	0	0	0	1
V_4	1	1	1	0	1	0	1	0
V_5	0	0	1	1	0	0	0	0
V_6	1	1	0	0	0	0	0	0

G_2

e_1	e_2	e_3	e_4	e_5	
1	1	0	0	0	V_1
1	0	0	1	1	V_2
0	1	1	1	1	V_3
0	0	1	0	0	V_4

G_3

	e_1	e_2	e_3	e_4	e_5
V_1	1	1	0	0	1
V_2	1	1	1	0	0
V_3	0	0	0	1	0
V_4	0	0	1	1	1

2) From figure G_1 & G_1'

$|V(G_1)| = |V(G_1')| = 5$

$|E(G_1)| \neq |E(G_1')|$ It is not an isomorphic

From figure G_{11} & G_{11}'

$|V(G_{11})| = |V(G_{11}')| = 8$

$|E(G_{11})| \neq |E(G_{11}')|$ This is not an isomorphic

From figure G_{12} & G_{12}'

$|V(G_{12})| = |V(G_{12}')| = 6$

$|E(G_{12})| = |E(G_{12}')| = 7$

Then, We have to determine the adjacency matrices A_1 & A_2

$$A_1 = \begin{array}{c} \\ a \\ b \\ c \\ d \\ e \\ b \end{array} \begin{array}{c} \begin{array}{cccccc} a & b & c & d & e & b \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

$$A_2 = \begin{array}{c} \\ a' \\ b' \\ c' \\ d' \\ e' \\ b' \end{array} \begin{array}{c} \begin{array}{cccccc} a' & b' & c' & d' & e' & b' \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 1 & 0 & 1 & 0 & 1 & 0 \end{bmatrix} \end{array}$$

$$I_6 = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \end{bmatrix}$$

Degree of(a) = Degree of(b') = 3

Degree of(b) = Degree of(b') = 2

Degree of(c) = Degree of(c') = 2

Degree of(d) = Degree of(d') = 2

Degree of(e) = Degree of(e') = 3

Degree of(f) = Degree of(b') = 2

$$P = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$