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Degree : BS (CS).

Semester : 2nd.

Subject : Discrete Structure.

Instructor : Sir Saif Ullah Jan.

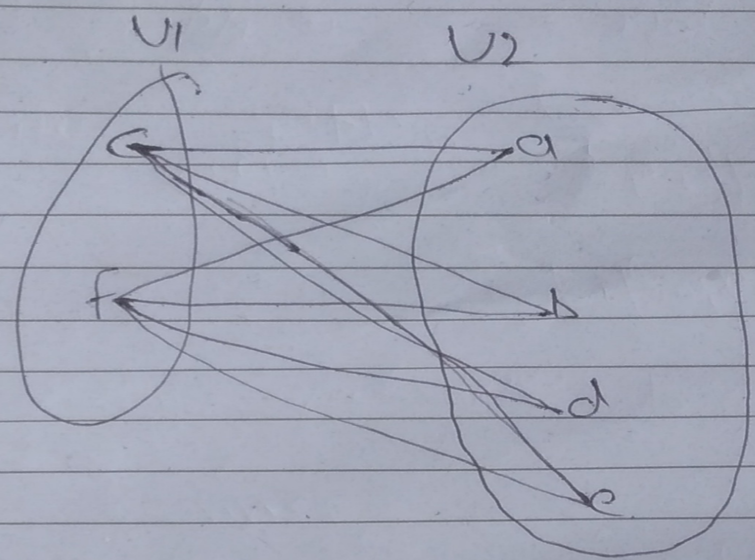
Online Final Assignment Spring 2019

Q1 Determine whether the graphs are bipartite.

Ans The graph (i) is not a bipartite graph because does not obey the properties of bipartites graph.
If we take "a", "d" and "f" in V_1 then "b" and "c" are connecete direct to each othe so the graph is not a bipatite graph.
In the graph no 1 the vertices of same set are connect in a sequence.
So the graph is not a bipartite grap.

(ii) For Graph (ii)

Solution



From the graph we can say that the give graph is a bipartite graph in one to many relation.

So the graph is a bipartite graph.

Q2 Determine whether the give pair of graphs is isomorphic.

Ans 2 Solution.

Properties of a isomorphic graphs.
1) Same no of vertices
(2) Same no of Edges.
(3) Equal no of vertices with given degree.

Hence from the above infomation the graph (i) is a isomorphic graph, because the no. of vertices are sam, the no. of Edges are same and the no. of vertices with given degree are equals. So the given graph (i) is an isomorphic graph.

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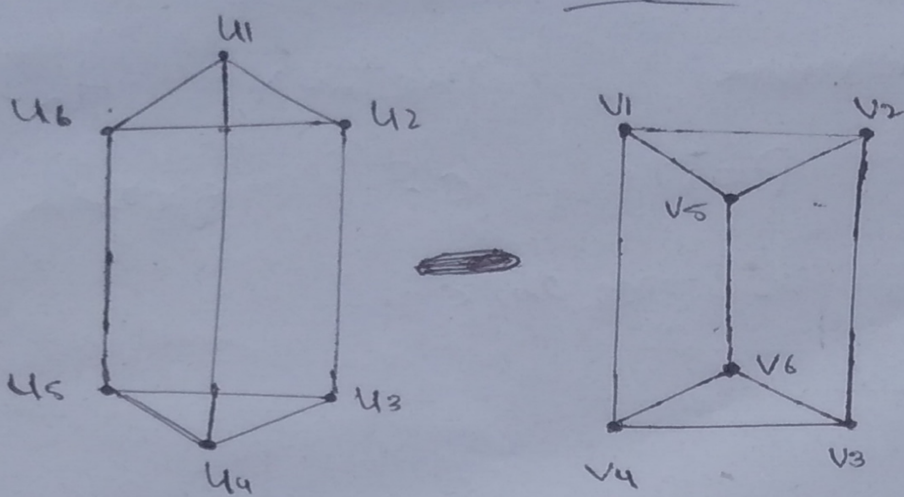
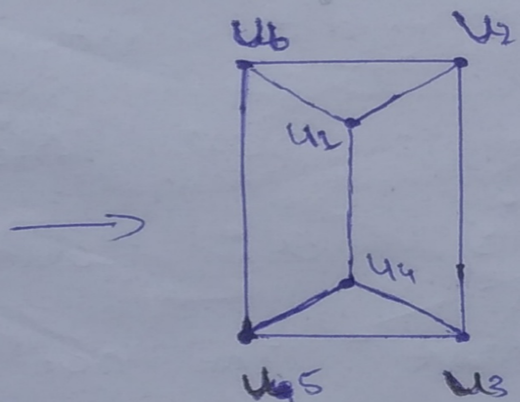
(i)



if we convert graph u to v.



$f(u_1) = v_5$

$f(u_2) = v_2$

$f(u_5) = v_4$

$f(u_3) = v_3$

$f(u_4) = v_6$

$f(u_6) = v_1$

one-to one function mapping.

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$(v_1, v_2) \cong (u_6, u_2)$

$(v_2, v_3) \cong (u_2, u_3)$

$(v_3, v_4) \cong (u_3, u_5)$

$(v_1, v_4) \cong (u_6, u_5)$

$(v_2, v_6) \cong (u_2, u_1)$

$(v_1, v_5) \cong (u_6, u_1)$

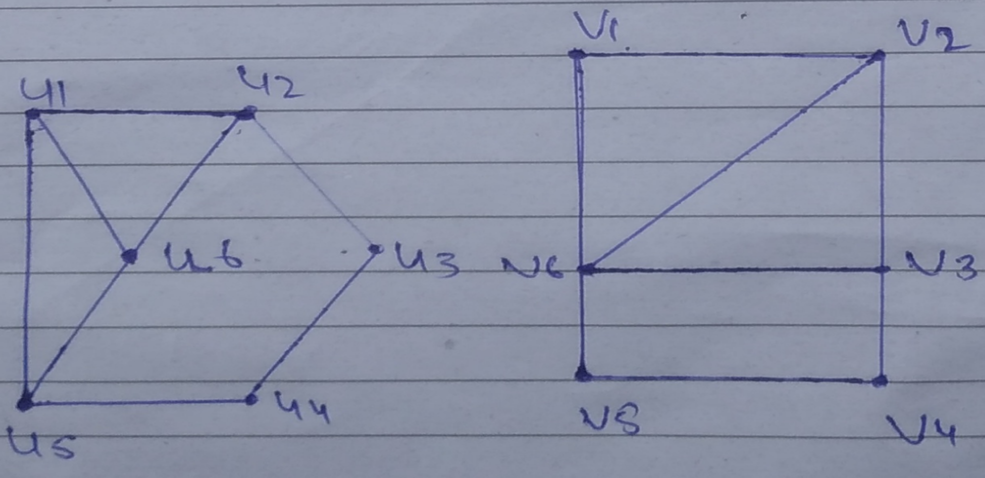
$(v_3, v_6) \cong (u_3, u_4)$

$(v_4, v_6) \cong (u_5, u_4)$

$(v_6, v_5) \cong (u_6, u_1)$

~~END of Q No~~

(ii)



The given graph (ii) has same no. of vertics, same no. of Edges and same no. of vertics with given degree.

$f(u_1) = v_1$ $\quad$ $f(u_3) = v_3$ $\quad$ $f(u_5) = v_5$

$f(u_2) = v_2$ $\quad$ $f(u_4) = v_4$ $\quad$ $f(u_6) = v_6$

one-to one function Mapping.

~~for~~

$(u_1, u_2) \equiv (v_1, v_2)$

$(u_2, u_3) \equiv (v_2, v_3)$

$(u_3, u_4) \cong (v_3, v_4)$

$(u_4, u_5) \equiv (v_4, v_5)$

$(u_5, u_6) \equiv (v_5, v_6)$

$(u_6, u_2) \cong (v_6, v_2)$

End of Q No 2

Q3 Are the simple graph with the following adjacency matrices isomorphic.

(i)

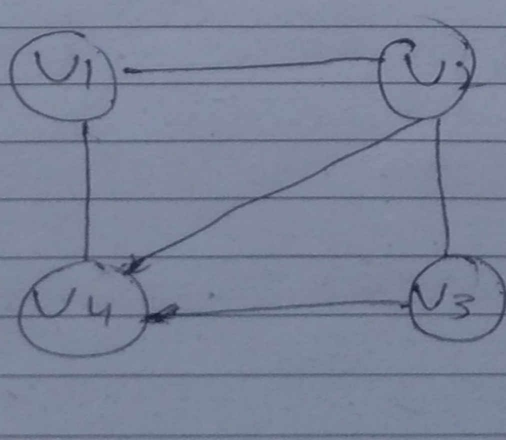
$$a = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix}$$

$$b = \begin{pmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix}$$

(a)

$$\begin{array}{c c} & \begin{array}{cccc} v_1 & v_2 & v_3 & v_4 \end{array} \\ \begin{array}{c} v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} & \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix} \end{array}$$

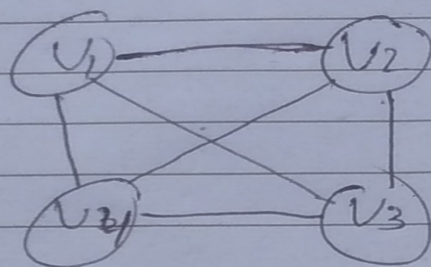
graph for matrix a -



Solution

For matrix (B) graph -

$$b = \begin{array}{c} \\ v_1 \\ v_2 \\ v_3 \\ v_4 \end{array} \begin{array}{c} \begin{array}{cccc} v_1 & v_2 & v_3 & v_4 \end{array} \\ \begin{pmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix} \end{array}$$



Hence as a result the graphs of two given matrices are not isomorphic, because the graphs are ~~not~~ do not have Same no- of edges.

~~End of Q.No~~

(ii) given adjacency matrices.

$$A = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{pmatrix}$$

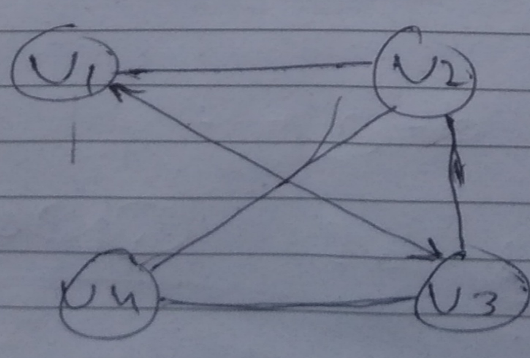
$$B = \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{pmatrix}$$

Solution.

~~For gra~~

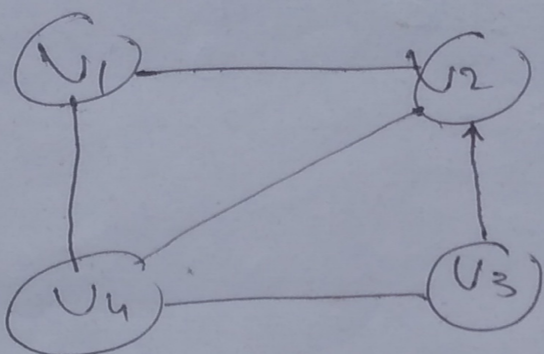
Graph for matrix A.

$$\begin{array}{c|cccc} & V_1 & V_2 & V_3 & V_4 \\ \hline V_1 & 0 & 1 & 1 & 0 \\ V_2 & 1 & 0 & 0 & 1 \\ V_3 & 1 & 0 & 0 & 1 \\ V_4 & 0 & 1 & 1 & 0 \end{array}$$



Graph for matrix B

$$\begin{array}{c c} & \begin{array}{cccc} V_1 & V_2 & V_3 & V_4 \end{array} \\ \begin{array}{c} V_1 \\ V_2 \\ V_3 \\ V_4 \end{array} & \begin{pmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{pmatrix} \end{array}$$



Hence the given matrices have same no - of vertices same number of Edges and same no - of vertices with given degree

End of QNo3

Q4 Determine whether the given graph has an Euler circuit Construct such a circuit when one exists. If no Euler circuit exists, determine whether the graph has an Euler path and construct such a path if one exists.

Ans Solution

The given graph (i) is an Euler path because it has more then two odd vertices. The no. of vertices in graph (i) are 9. So the odd vertices in graph (i) is 5 which odd degree vertices

a → b → c → b → d → e → f → h → g → h → i

a → b → c → b → d → e → f → h → g → h

Ans

(ii) The given graph is an Euler circuit because Edges of a and d is same

Constraction.

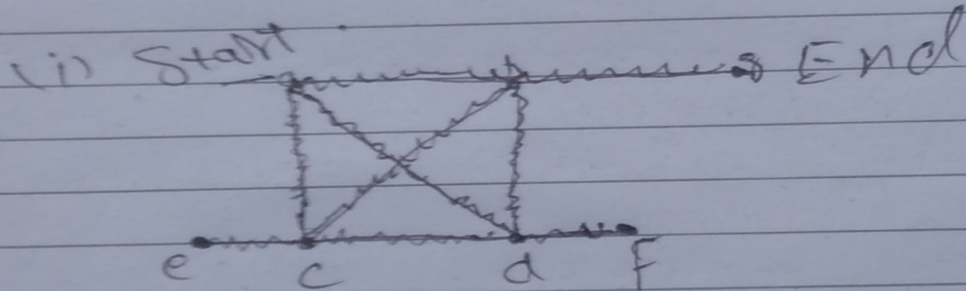
a → b → e → c → e → b → d → a.

$\boxed{a, b, e, c, e, b, d, a}$

Hence the graph (ii) is an Euler circuit because d termenated the direction to a.

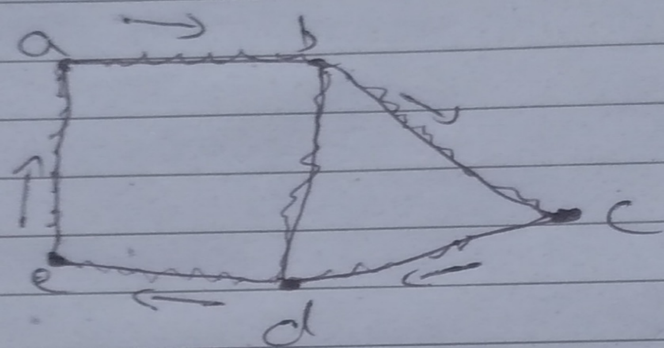
Q5 Determin whether the given path has a Hamilton circuit. If it does, find such a circuit. If it does not give an argument to show why no such circuit exists.

(i)



This graph is a Hamilton path because "a" is the start point and "g" is end point and this graph does not termenated by same vertices. So this a Hamilton Path.

(ii) The graph (ii) is a Hamilton Circuit because it is Start from "a" and termenated by "a".



So the given graph is a Hamilton circuite.