NAME → MUHAMMAD USAMA

ID NO: → 16742

DEPT → BS(CS)

SUBJECT → DESCRETE MATHS

TEACHER NAME → SAIF ULLAH JAN SIR

DATE → 24/06/2020

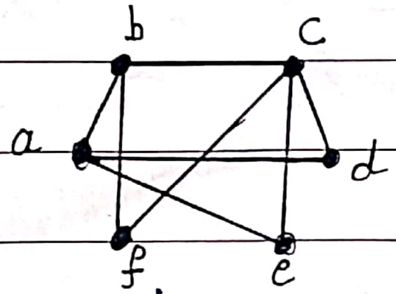
(FINAL TERM EXAM)

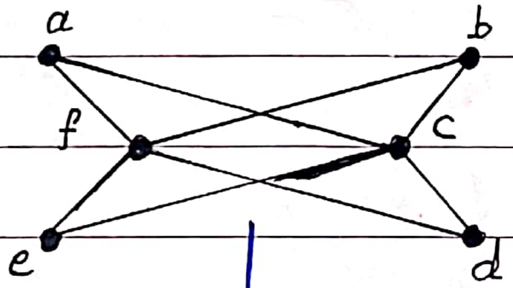
IQRA NATIONAL UNIVERSITY
(PESHAWAR)

Date. ________

QNO: 1 -------

Determine wether the Graph is bipartite.





1

2

ANS:

Bipartite Graph:

A Bipartite Graph G is a Simple

Date:

Graph whose vertex Set can be partitioned into two matually Disjunction non empty Subsets A and B Such That the vertices In A may be Connected To vertices in B, But no verties in A are Connected to Vertices in A and no vertices in B are Connected to vertices in B.

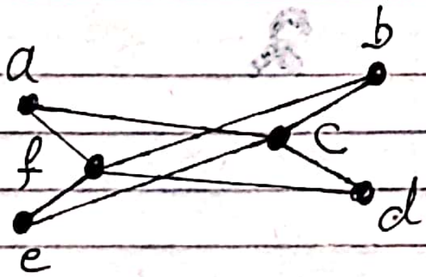
→ Determining berpartile Graphs:

The following labeling procedure determines wether a Graph is bipartite Are Not.

1) lable any vertix a.
2) lable all vertices Adjacent to a with the lable b.
3) lable all vertices, That Are Adjacent to a vertex just labbled b with lable a.
4) Repeated Steps 2 and Steps 3 until all vertices Got a distinct lable (a bipartite Graph) or there is a Conflict i.e., A vertex is labled with A and b (Not a bipartite Graph)

- - - - - - - - - - -

(i) –



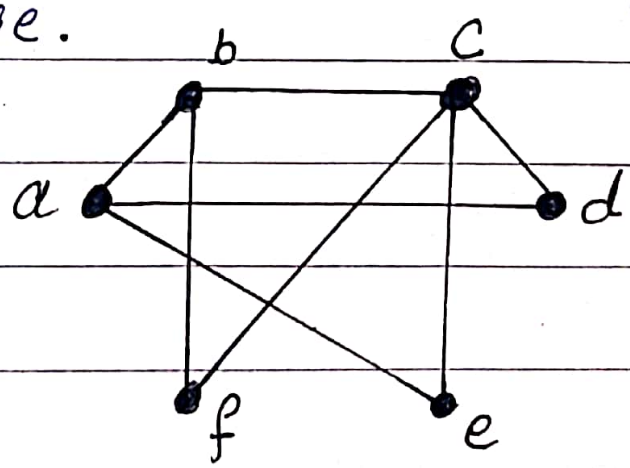
Solution:

a). first assign red color to Vertex a. Next assign blue color to vertices b, c, and d which are Adjacent to vertex a. finally, Assign read color to vertex c. As The Graph Shows on The left-hand-Side, There are No two adjacent vertices having The Same color, Hence (the Graph is Bipartite) in fact, it is the Complete bipartite $K_{2,3}$ as The Graph Shown on The right-hand-Side.

Sol: for The ~~Above~~ below Graph,
The Graph is bipartite Showing they are 2. Colorable.

The easy once are the once that they are 2 Colorable you just find ~~of the vertices~~ As 2 colorable i.e. a coloring of the vertices of the same color are never adjacent along an edge.

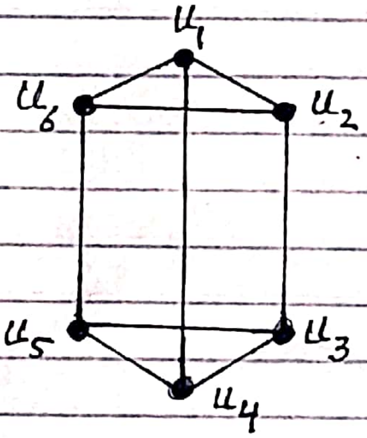
(ii)

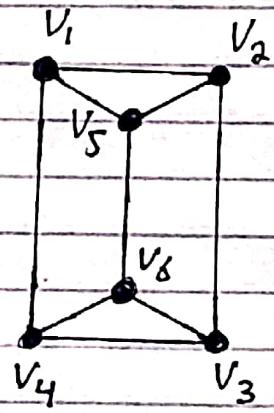


QNO: 2

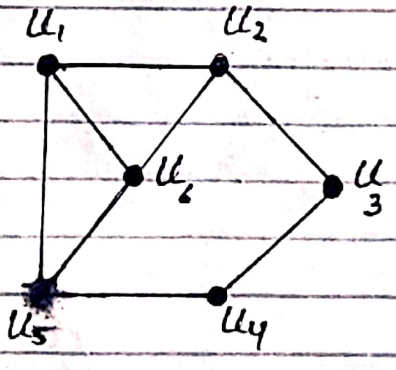
Determine wether the Graph is isomorphic.

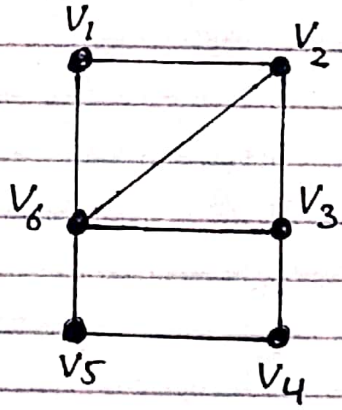
(i)





(ii)





ANS:-

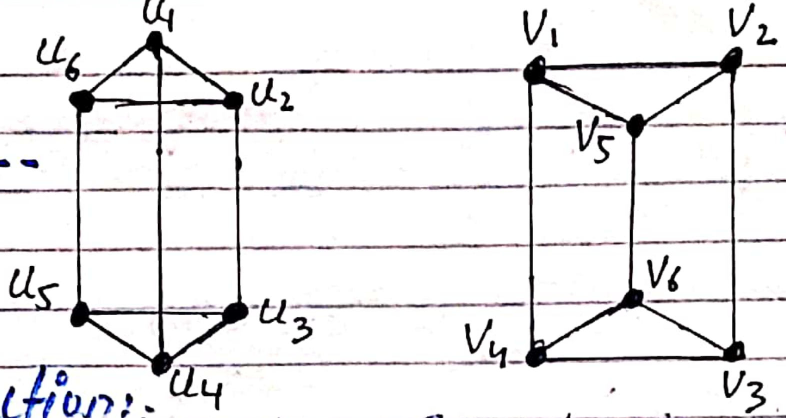
Isomorphism of a Graph:

The Simple Graph $G=(V_1, E_1)$ and $G=(V_2, E_2)$ are Isomorphism f from V_1 to V_2 with The property That a and b are adjacent In G_1 if and only if $f(a)$ and $f(b)$ are Adjacent in G_2, for All a and b in V_1. Such a function f is Called isomorphism.

" two Simple Graph That are not isomorphic Are called nonisomorphic."

8

(i) ---



Solution: The Graph is isomorphic.

One isomorphism is $f(u_1) = V_5$, $f(u_2) = V_2$, $f(u_3) = V_3$, $f(u_4) = V_6$, $f(u_5) = V_4$, and $f(u_6) = V_1$.

Sol :-

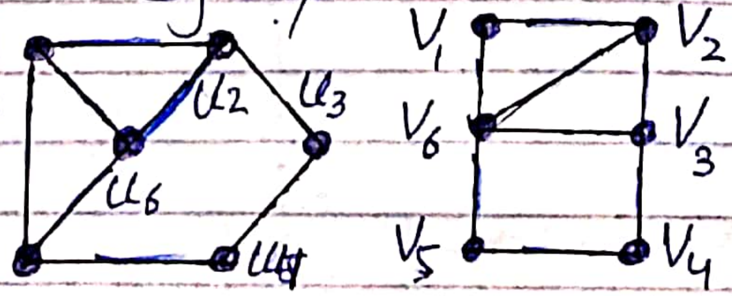
first we see the ~~Solution~~ Graphs.

they are non-isomorphic because when we Campare Vertices v and u. That are not Same to One another.

(ii)

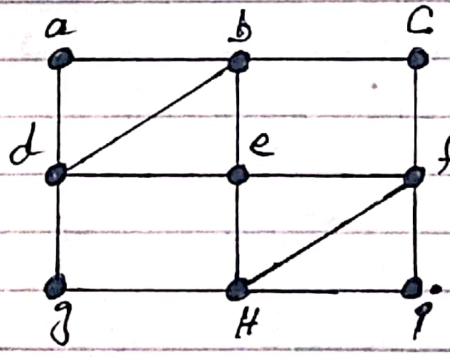
There fore

The above Graphs is Isomorphic.

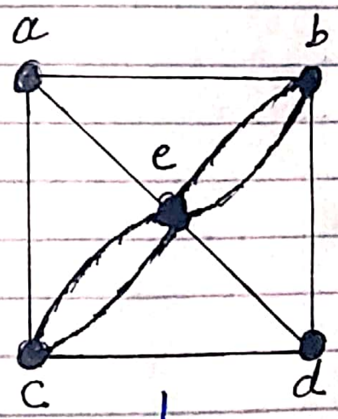


QNO: 3 -----

Determine wether the Given Graph has an Euler circuit. Construct such as circuit when on exists. if no Euler circuit exists, determine whether the Graph has an Euler path And Construct such a path if one exists.



(i)



(ii)

ANS:----

EULER PATH AND CIRCUIT:

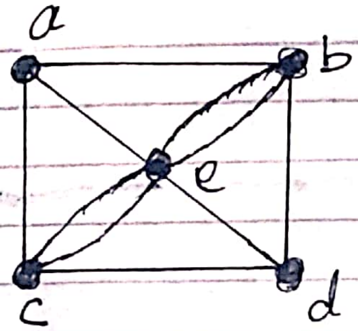
"An Euler circuit in a Graph G is Simple circuit Containing every edge of G."

"An Euler path in G is a Simple path Containing every edge of G."

Theorim:-

A Concerned multi-graph with at least two vertices has an Euler Circuit if and only if each of its vertices has An even degree.

(i)---



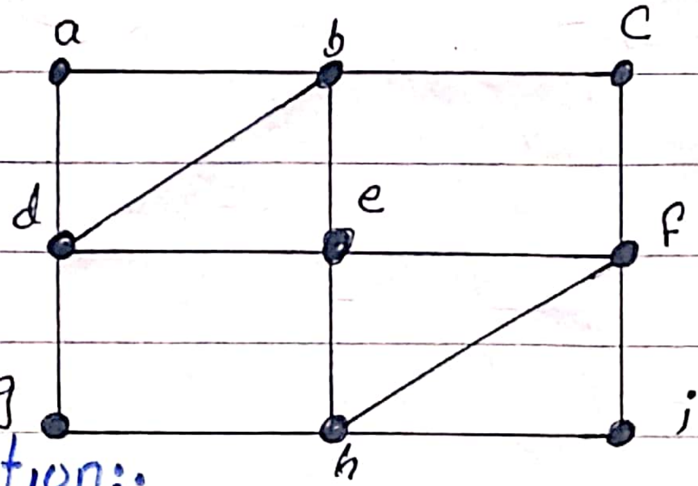
Solution:- By Theorem, we Know This graph does not have An Euler circuit. b/c we Have ~~four~~ Two vertices of odd degree. (a and d). This graph does have an Euler path path. The path is as follows: (a, e, c, e, b, e, d, b, a, c, d.)

- - - - - - - - -

13

Date:

(ii) ---



Solution:

It is an Euler circuit because its initial and terminal points is one.

(a, b, c, d, e, f, g, h, i, a).

Start and end with a:

QNO: 1/ -----

ARe the Simple Graps With the following adjaceny Matrices isomorphic ?

$$\begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 0 & 1 & 1 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 1 & 1 & 1 & 0 \end{bmatrix} \longrightarrow (i)$$

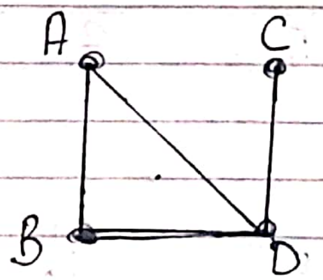
$$\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix} \cdot \begin{bmatrix} 0 & 1 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 1 & 0 \end{bmatrix} \longrightarrow (ii)$$

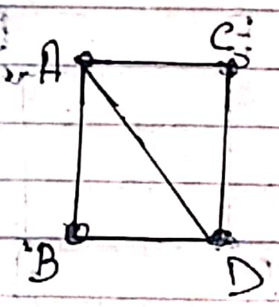
ANS:------

(1)

$$\begin{array}{c|cccc} & A & B & C & D \\ \hline A & 0 & 1 & 0 & 1 \\ B & 1 & 0 & 0 & 1 \\ C & 0 & 0 & 0 & 1 \\ D & 1 & 1 & 1 & 0 \end{array} \quad , \quad \begin{array}{c|cccc} & A & B & C & D \\ \hline A & 0 & 1 & 1 & 1 \\ B & 1 & 0 & 0 & 1 \\ C & 1 & 0 & 0 & 1 \\ D & 1 & 1 & 1 & 0 \end{array}$$

Solution:





Adjancy lists:

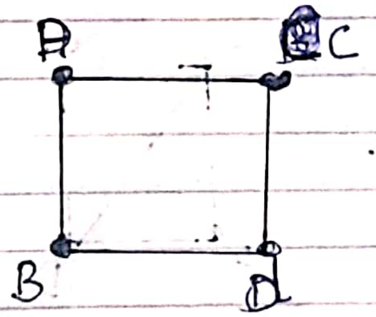
a = B, d	a = C, B, A
b = A, d	b = A, d
c = d	c = A, d
d = A, B, C	d = A, B, C

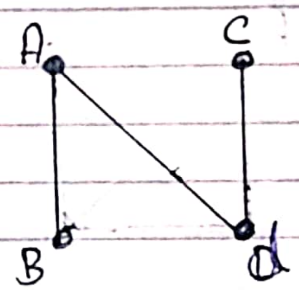
So the Given Simple Graphs with with above Adjancy is "Not isomorphic".

(ii)

$$\begin{array}{c|cccc} & A & B & C & D \\ \hline A & 0 & 1 & 1 & 0 \\ B & 1 & 0 & 0 & 1 \\ C & 1 & 0 & 0 & 1 \\ D & 0 & 1 & 1 & 0 \end{array} \qquad \begin{array}{c|cccc} & A & B & C & D \\ \hline A & 0 & 1 & 0 & 1 \\ B & 1 & 0 & 0 & 0 \\ C & 0 & 0 & 0 & 1 \\ D & 1 & 0 & 1 & 0 \end{array}$$

Solution :





Adjancy lists :-

A : C, B
B : A, a
C : A, d
d : B, C

A : B, d
B : A
C : d
d : A, C

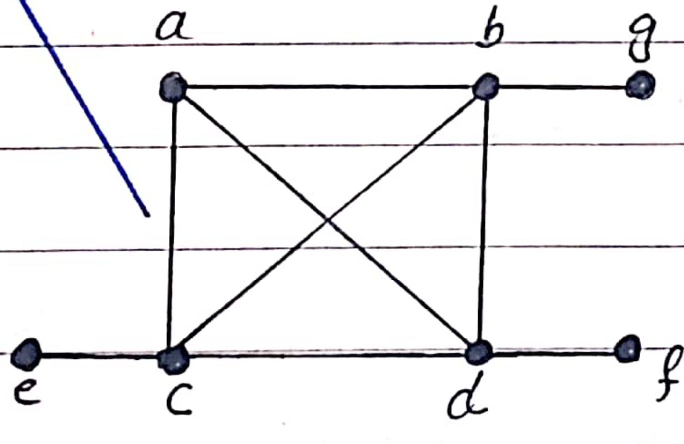
So the Above Simple Graphs is "Not isomorphic"

Date. ______

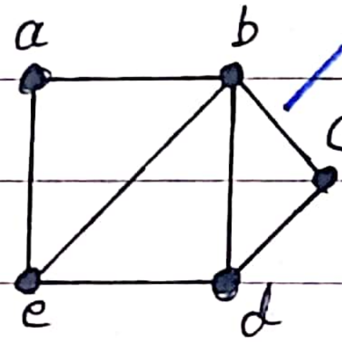
Q NO: 5 -----

Determine wether the Given Graph has a Hamilton Circuit. if it does, find Such a circuit. if it does, Give an argument to Show Why no Such circuit exists.

(i)



(ii)



Date:

ANS:------

HAMILTON PATH AND CIRCUITS

A path $x_0, x_1 \text{------} x_n - 1, x_n$ in the Graph $G = (V, E)$ is called a HAMILTON ~~CIRCUIT~~ PATH if $V = (x_0, x_1, \text{----} x_n - 1, x_n)$ And $x_i \neq x_j$ for $0 \leq i < j \leq n$.

. A Circuit $x_0, x_1 \text{-----} x_n - 1, x_n, x_0$. (With n > 1) in a Graph $G = (V, E)$ is called A Hamilton Circuit. if $x_0, x_1 \text{----}, x_n - 1, x_n$ is a Hamilton path.

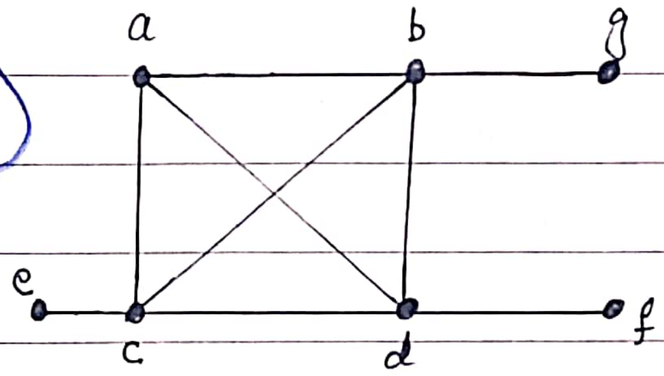
↳ Dirac's theorem:

if G is a simple Graph with n vertices

Date.

With $n \geq 3$ Such that the degree of every vertex in G is at least $n/2$, Then G has a Hamilton Circuit.

(i)

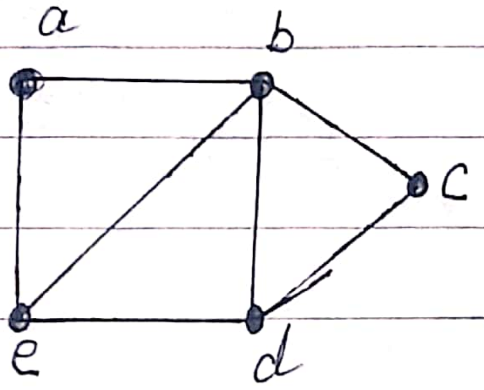


Solution:

There is no Hamilton circuit because they are vertices of degree 1 (Pendants) in the graph.

Date:

(ii)-



Solution:

This Graph Has A Hamilton Circuit.
a,b,c,d,e,a is a Circuit.

The End*