GH RAISONI COLLEGE OF ENGINEERING
CAE - I
2020 - 2021 EVEN TERM
CAE - 1 EXAMINATION SUMMER - 2021 (ONLINE MODE)

DEPARTMENT: ARTIFICIAL INTELLIGENCE
SEMESTER/ SECTION : 4th / A
DATE OF EXAMINATION: 13/02/2021
SUBJECT: GRAPH THEORY AND NUMBER SYSTEM
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CO1.
Q.1.

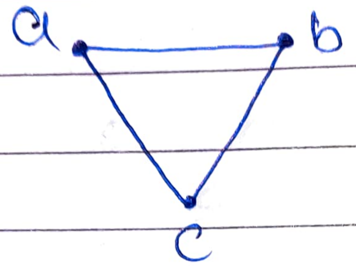
Simple Graph:
A simple graph (V, E) consists of a nonempty set representing vertices, V, and a set of unordered pairs of elements of V representing edges E.
A simple graph has:
→ no arrows
→ no loops

Shawari

→ cannot have multiple edges joining vertices.

Example:

$V = \{a, b, c\}$, $E = \{\{a, b\}, \{b, c\}, \{a, c\}\}$



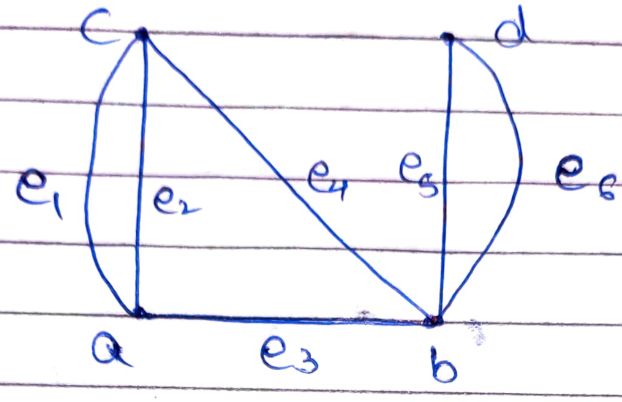
Multigraph:
A multigraph is a set of vertices, V, a set of edges E and a fuction:

$$f : E \rightarrow \{\{u, v\} : u, v \in V \text{ and } u \neq v\}$$

Example:

$V = \{a, b, c, d\}$, $E = \{e_1, e_2, \ldots, e_6\}$,
$f: E \rightarrow \{\{u, v\}: u, v \in V \text{ and } u \neq v\}$

e	e_1	e_2	e_3	e_4	e_5	e_6
$f(e)$	$\{a, c\}$	$\{a, c\}$	$\{a, b\}$	$\{c, b\}$	$\{b, d\}$	$\{b, d\}$



Pseudograph:

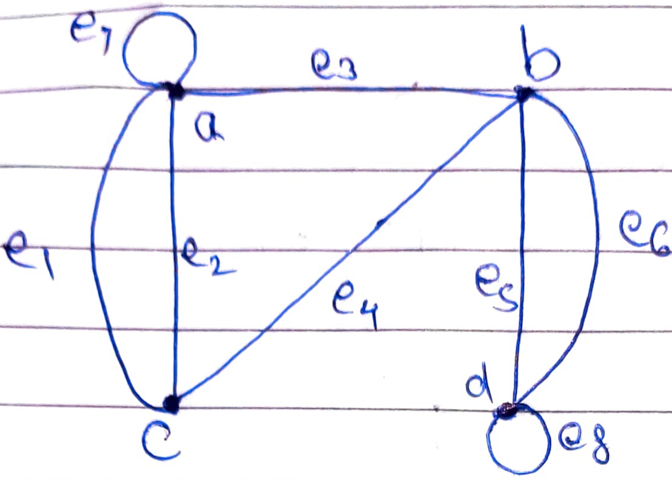
A pseudograph is a set of vertices V, a set of edges E and a function $f: E \to \{\{u, v\} : u, v \in V\}$. If $e \in E$ is such that $f(e) = \{u, v\} = \{u\}$, then we say e is a loop.

Example:

$V = \{a, b, c, d\}$, $E = \{e_1, e_2, \dots, e_8\}$,
$f: E \to \{\{u, v\} : u, v \in V\}$

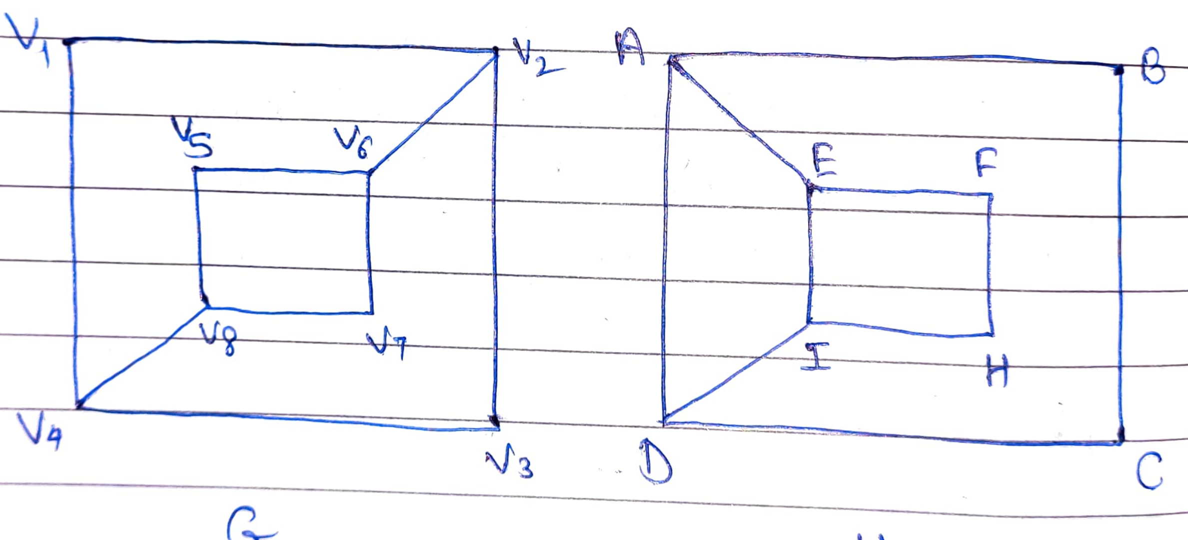
e	e_1	e_2	e_3	e_4	e_5	e_6	e_7
$f(e)$	$\{a, c\}$	$\{a, c\}$	$\{a, b\}$	$\{c, b\}$	$\{b, d\}$	$\{b, d\}$	$\{a\}$

	e_8
	$\{a\}$



CO1.

Q.2.



G H

The graph G and H both have 8 vertices and 10 edges. They both have 4 vertices each of degree 3 and 4 vertices each of degree 2.

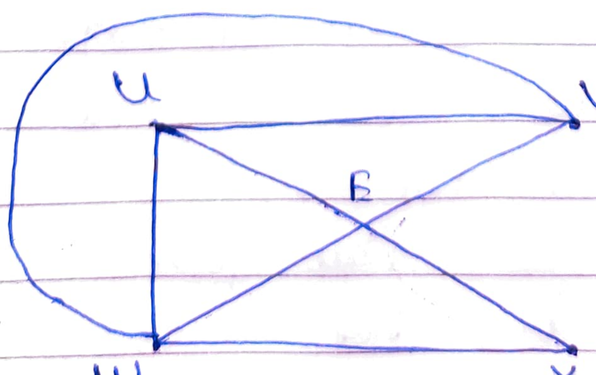
Now consider degree $(v_1) = 2$ in G. Then v_1 must correspond to either B, C, H, F. Since these are vertices of ~~deg~~ degree 2 in H.

However, each of these vertices in H is adjacent to another vertex of degree 2 in H viz B is adjacent to C, F is adjacent to H but A is adjoint to V_2 and V_4 in G which are of degree 3. Thus the preservation of adjacency of the vertices is not maintained.

∴ G and H are not isomorphic graphs.

CO2.

Q.3. Given graph is :



Pg. no. 5

The vertex $V = \{U, V, W, E, X\}$
Edges $E = \{(U, V), (U, W), (U, E)$
$(E, X)(W, X)(V, W)\}$

Now, degree of each vertices are:

$deg_G(U) = 3$
$deg_G(V) = 3$
$deg_G(W) = 4$
$deg_G(X) = 2$

Now u and v have only two vertices of odd degree of 3.

According theorem, a connected graph contains a euler trail, but not an eulerian circuit, if and only if it has exactly two vertices of odd degree.

Thus, the path from by edge ie.
$(U, V) - (V, W) - (W, U) - (U, X) - (X, W) - (W, V)$ is an eulerian trial.
Thus, the above graph has eulerian trial but not eulerian circuit.