GT ASSIGNMEN 01

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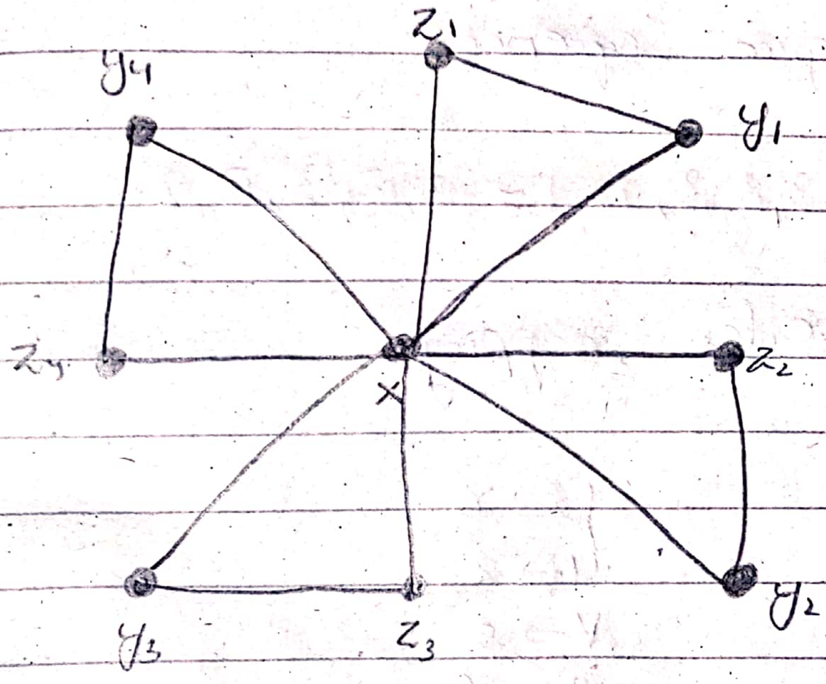
Sec: B

QUESTION NO.01



QUESTION NO.02

1) No. of vertices: 5 = 5

2) No. of edges: 7 = 7

3) Degree Sequence

3, 3, 3, 3, 2 = 3, 3, 3, 3, 2

4) Vertex mapping:-

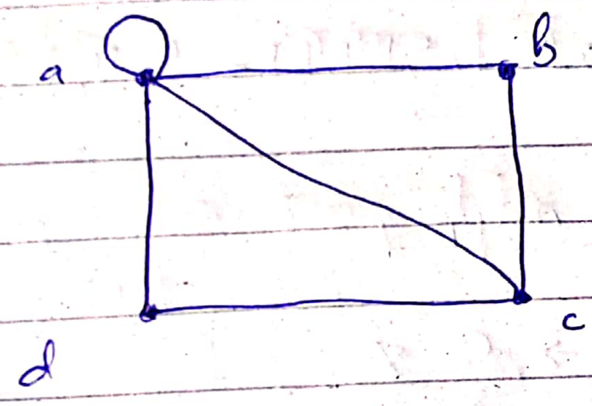
$y \to r$
$u \to z$
$v \to s$
$w \to t$
$x \to q$

5) Validation

$ux \to zq$ ✓
$xw \to tq$ ✓
$wy \to tr$ ✓
$yv \to rs$ ✓
$uv \to zs$ ✓
$xv \to sq$ ✓
$uw \to zt$ ✓

Since all edges are successfully validated we can say that the current bijection specifies the isomorphism between these 2 graphs

QUESTION NO. 03



QUESTION 04

01) No. of vertices: 10 = 10

02) No. of edges: 9 = 9

03) Degree sequence:

4, 4, 2, 2, 1, 1, 1, 1, 1, 1 = 4, 4, 2, 2, 1, 1, 1, 1, 1, 1

04) Vertex mapping :-

3 → c ✗

3 → h ✗

(Since 3(deg=4) cant be mapped to any vertex of Graph 2 that has degree 4 (Both c & h don't fulfill the criteria) thus we can say that the graphs are not isomorphic since their vertices cannot be mapped

QUESTION NO.05

$$x + y = 20 \quad \text{—(1)}$$

where x is the no. of deg 3 vertices & y is the no. of deg 2 vertices

By handshaking lemma.

$$3x + 7y = 62 \times 2$$

$$3x + 7y = 124$$

$$\because y = 20 - x$$

$$3x + 7(20 - x) = 124$$

$$3x + 140 - 7x = 124$$

$$\cancel{+}4x = \cancel{+}16$$

$$\boxed{x = 4}$$

$$\therefore \boxed{y = 16}$$

There a (4) four - vertices that have degree = 3

Ans

QUESTION 06:

FOR a 3 regular 7 vertex graph.

$$3 \times 7 = 2|E|$$

$$\frac{21}{2} = |E|$$

$$\boxed{|E| = 11.5}$$ (NOT POSSIBLE)

Since |E| must always be positive integer therefore the said graph is not possible.

QUESTION: 07:

By Havil Hakimi theorem

$\overset{\times}{6}, \underbrace{5, 4, 4, 3, 2}$

$\overset{\times}{4}, \underbrace{3, 3, 2, 1}$

$\overset{\times}{2}, \underbrace{2, 1, 0}$

$\overset{\times}{1}, \underbrace{0}, 0$

$-1, 0$ ✗

Thus the given ~~graph~~ vertex sequence doesn't represent a valid graph since it doesn't fulfill the havil hakimi theorem

QUESTION NO. 08:

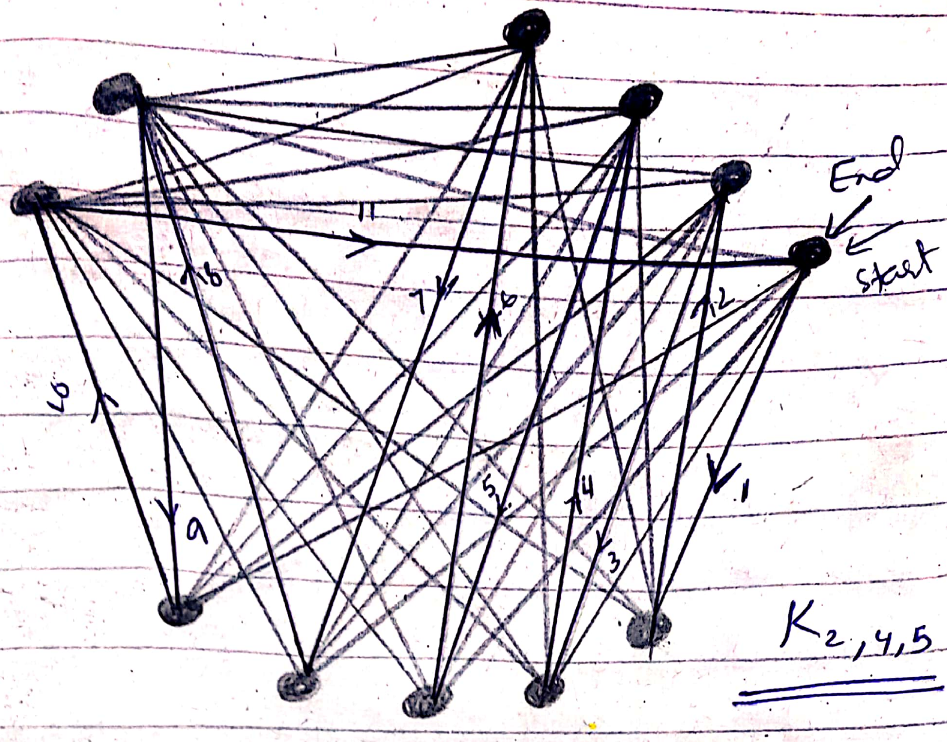
> The question asks us to find a curve that passes through each wall "exactly once"

> So essentially we are looking for a eulerian circuit in the given graph.

> On close observation we find 8 vertices that have "Odd degrees"

> we know that an eulerian cannot contain odd degree vertices, only these basis we can say that no such curve is possible in the given graph

QUESTION 09



$K_{2,4,5}$

The graph on the left i.e. $K_{2,4,5}$ (left) is hamiltonian. The hamiltonian cycle is illustrated in the graph above