Assignment # 02

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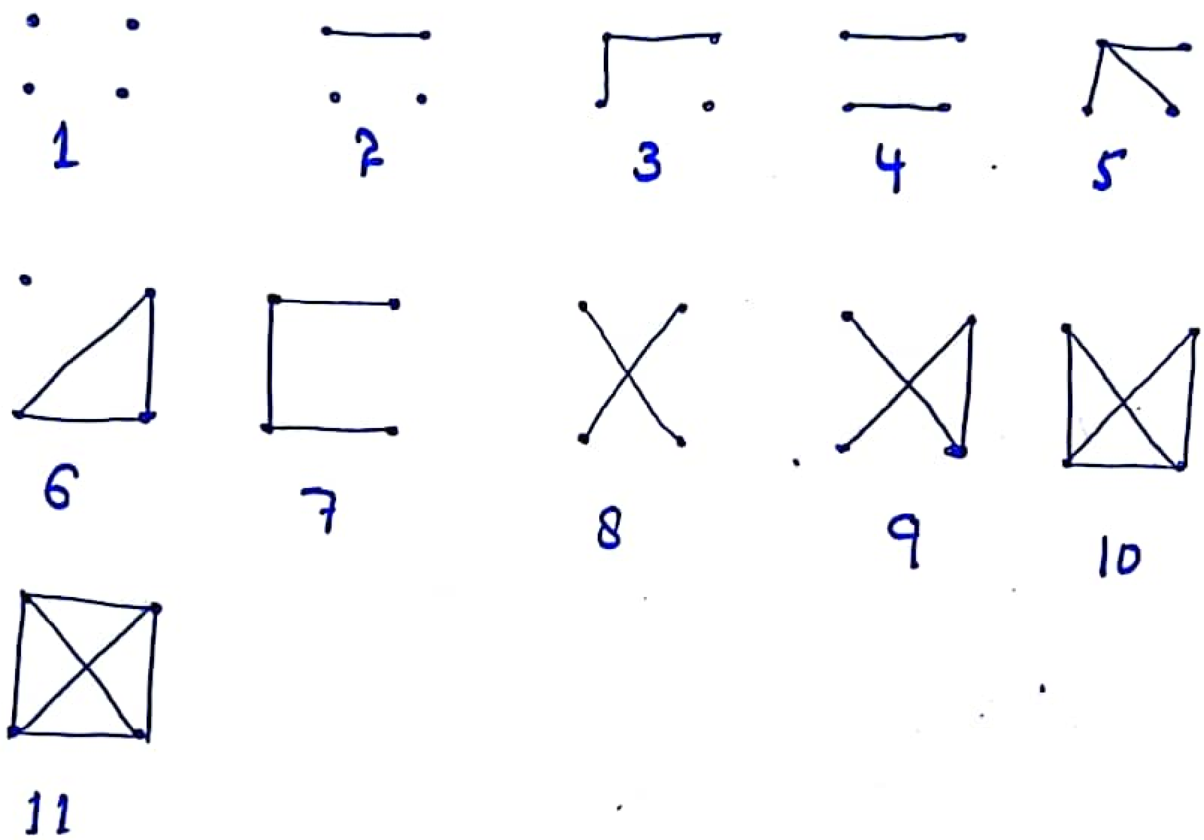
Question NO.02

Draw the eleven unlabelled simple graph with four vertices



Question No.2

(a) If two graphs have the Same degree Sequare, Squence must they be isomorphic..??

Solution:

No. two graphs with the same degree Sequence are not necessarily isomorphics. This is known as the Havel-Hakimi theorem. while having the same degree Sequence is a necessary condition. for isomorphic it is not a sufficient condition. there are can be non-isomorphic groups with identical degree Sequence.

Question NO. 2

(b) If two graphs are isomorphic, must they have the same degree sequence.??

Solution:

Yes If two graph are isomorphic they must have the same degree senquence Isomorphic implies that the structure of the graph is the same including the degrees of their vertices therefore, If two graphs are isomorphic their degree sequence must be identical

Question No.3

(2.5) Let G be a degree sequence (1,2,3,4)...?

Solution.

By handshaking Lemma.

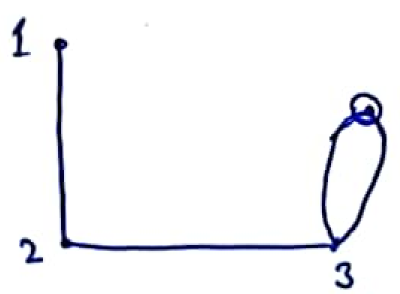
"The sum of the degree of all vertices in a graph is equal to twice the number of edges".

No of vertices = 4

totall degree sum = $1+2+3+4 = 10$

No of edges = $10/2 = 5$

So the graph G with the degree sequence (1,2,3,4) has 4 vertices and 5 edges



Question (04)

→ prove that if G is simple graph

By Pigeonhole principle.

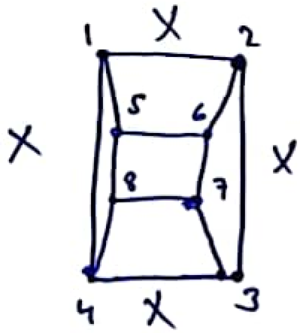
If G has exactly two vertices they can either have the same degree or different degree. If they have the same degree, were done if They have different degrees, then there are at least two vertices then the maximum possible degree of a vertices in G is $|V|-1$ where $|V|$ is because in a simple graph a vertex can be adjacent to all other vertices except itself.

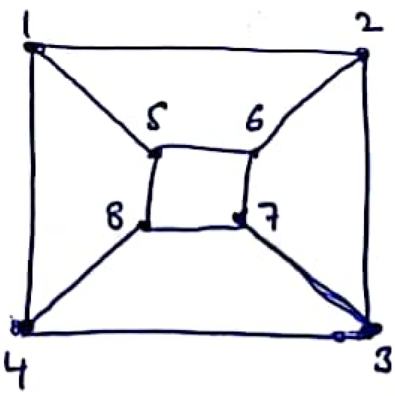
Question NO (05)

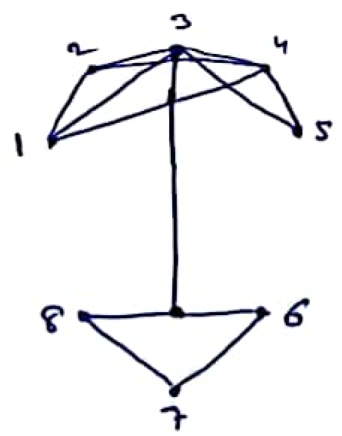
Draw

(a) Two non-isomorphic regular with 8 vertices and 12 edges ..??

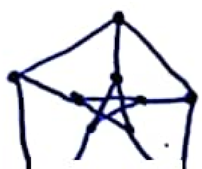
Solution:

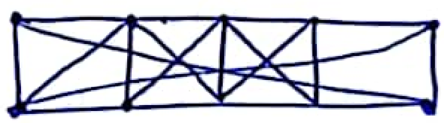






(b) Two non-isomorphic regular graph





Q5

(d) (5- dimensional hypercube)

The No of edges in a hypercube of demension d is $2^d * d/2$

For Q5, the 5-dimensional hypercube it has $\frac{2^5 \times 5}{2} = 80$ edges.

(e) the dodechedran (a polyhedron with 12 faces

By Euler formula for polyhedra
$V - E + F = 2$

where

V → Vertices
E → Edges
& F → Faces

For a dodechodran $V = 20$ and $F = 12$

E : $20 - E + 12 = 2$

$\Rightarrow E = 30$

→ So dedechedron has 30 edges.

Question No.6

(a) C_{10}

cycle with 10 vertices

A cycle with n vertices has n edges

(b)

$K_{9,10}$

Complet bipartite graph with parts of size 9 and 10.

↳ A complete bipartite graph with parts of size m and n has m*n edges
So, $K_{9,10}$ has $9 * 10 = 90$ edges.

(C) K_{10}

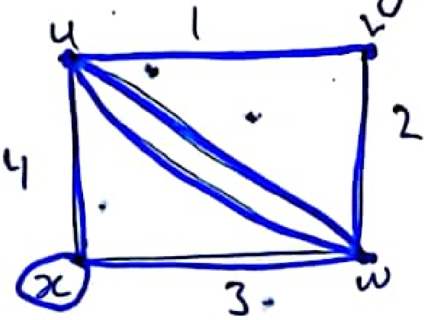
Compute graph with 10 vertices
A complete graph with n vertices has
$C(n,2) = \frac{n(n-1)}{2}$ edges

↳ So, K_{10} has $\frac{10(10-1)}{2} = 45$ edges.

Question No. 07

(a) Consider the group G Show an vertices v and x are adjacent.

These vertices are not adjacent as thy are not connected by an edge.



(b) edge 6 is incident with vertex w

Yes edge 6 is incident with vertex w it is endpoint.

(c) Vertex x is incident with edge

Yes vertex w and edge.

Yes vertex x is incident with edge.

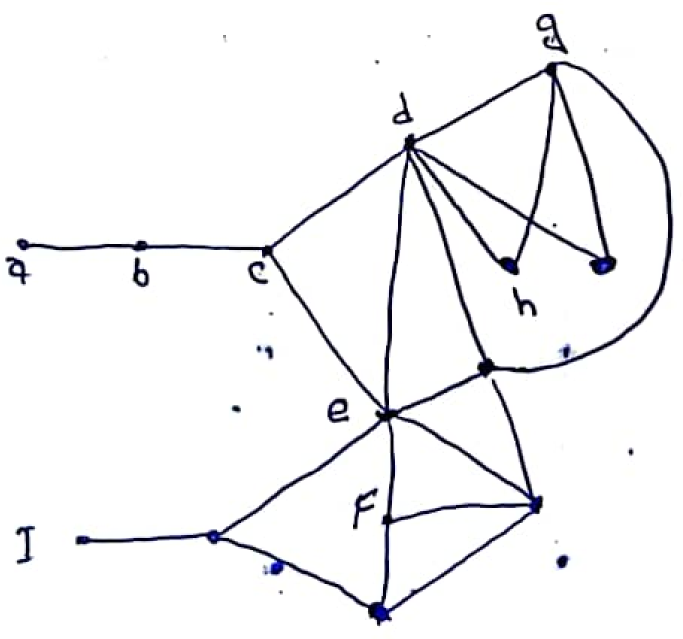
(d) vertex w and edge 5 and 6 form Subgroup of G.

No vertex w and edge 5 & 6 from Subgroup of G.

Question NO.8

Draw simple connected graph degree sequence (1,1,2,3,3,4,4,6)

Sol



$\deg(a) = 1$

$\deg(b) = 2$

$\deg(c) = 3$

$\deg(d) = 6$

$\deg(F) = 3$

$\deg(g) = 4$

$\deg(h) = 4$

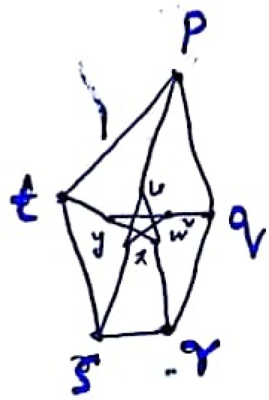
$\deg(I) = 1$

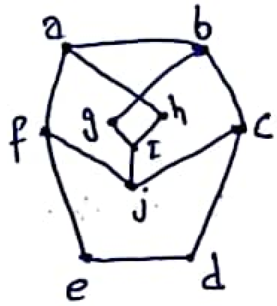
Question NO.9

By Suitably labelling the Show that the following graph isomorphic.

Sol

(G1)





(G2)

No of edges = $E(G_1) = 15$ = No of Edge of $E(G_2)$

No. of vertices = $V(G_1) = 10 = V(G_2)$

Degree of Sequence

$G_1 : \{3, 3, 3, 3, 3, 3, 3, 3, 3, 3\}$

$G_2 : \{3, 3, 3, 3, 3, 3, 3, 3, 3, 3\}$

Now,

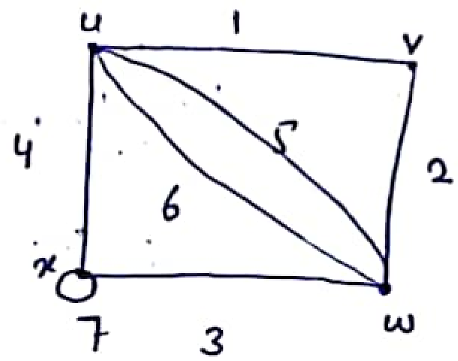
$p \leftrightarrow a$		$u \leftrightarrow h$	
$q \leftrightarrow b$		$v \leftrightarrow c$	
$r \leftrightarrow c$		$w \leftrightarrow j$	
$s \leftrightarrow d$		$x \leftrightarrow d$	
$t \leftrightarrow f$		$y \leftrightarrow i$	

Questio No. 10.

For a graph shown on the right write down:

(a) A walk of length 6 7' between 'u' and 'w'

uvuxuvvw



(b) All the cycles of length 1,2,3,4

Sol

length 1 : The loop xx

length 2 : The multiple edge uxu

Length 3 : The triangle uwxu

Length 4 : The quadrilaterals uvwxu.

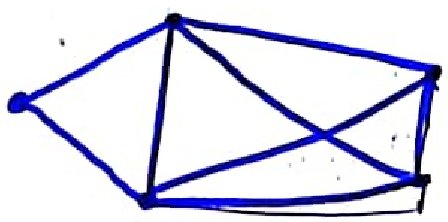
(c) A path of maximum length.

Sol uvwx

Question No. 17 :

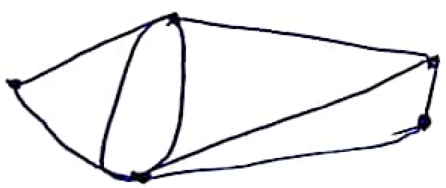
(2.8) Draw four connected graphs G_1, G_2, G_3 and G_4 with 5 vertices and 8 edges satisfying

$G_1 \rightarrow$ G_1 is simple graph.

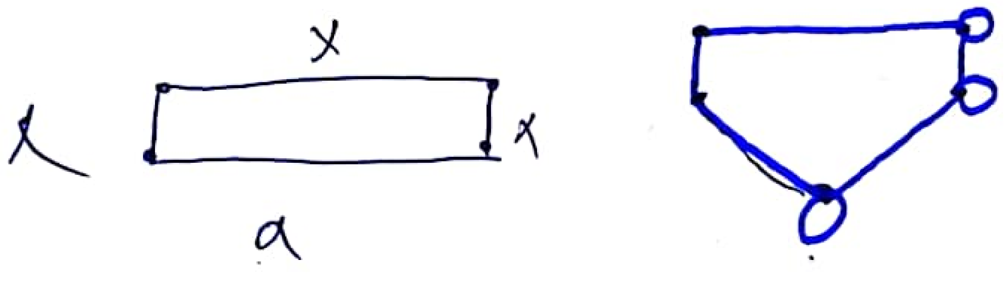


G_1

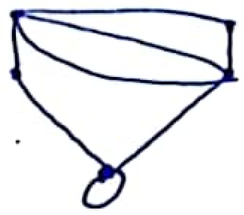
$G_2 \rightarrow$ G_2 is non-simple graph with no loop.



$G_3 \rightarrow$ G_3 is non-simple graph with no multiple edges.



$G_4 \rightarrow$ G_4 is a graph with both loops and multiple edges.



Question No. 13

The girth of a graph 'G' is the length of Shortest cycle and circumference is length of Longest cycle Find both for.

(a) Peterson graph.

girth = 4, circumference.

(b) The 4- cube graph Q_4

grith = 4

circumference.

Question No. 14

prove that if every cycle of a graph has an even number of edges then graph is bipartite.-??

Sol : If 'G' is bipartile with vertex set V_1 and V_2 Every step along a walk takes you either from V_1 to V_2