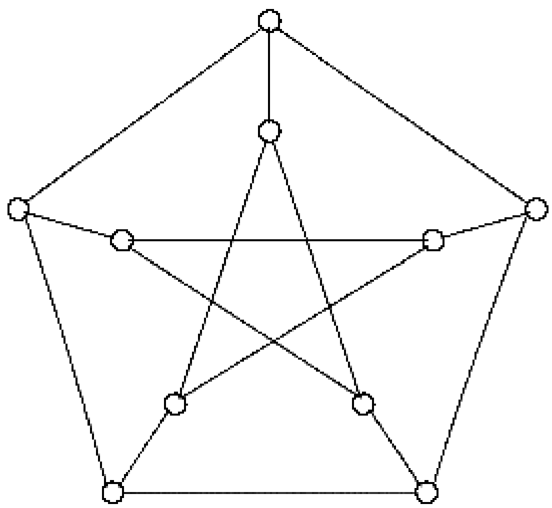
Some special graphs:

1- Petersen graph

The graph shown in Figure



2- Complete graph

In this graph any vertex adjacent with each others , write as K_n , where n is the number of the vertices .

Example : K_2

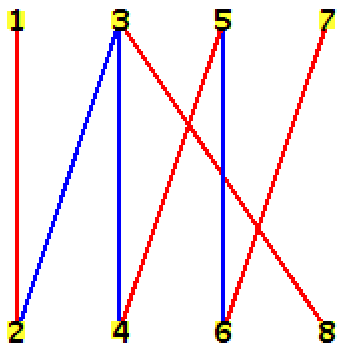
Remark:

$$\varepsilon(K_n) = \begin{cases} n(n-1) & if\ K_n\ is\ directed \\ \frac{1}{2}\ n(n-1) & if\ K_n is\ undirected \end{cases}$$

$3 - Bipartitegraph$

A bipartite graph is a graph that the vertex – set can be partition into two sub sets X and Y such that the end – vertices of any edge one in X and the other one in Y .

Example:



4- complete bipartite graph

A complete bipartite graph is a bipartite $G(X \cup Y, E)$ in which each vertex of X is jointed by an edge to vertex of Y. If $|X| = m$ and $|Y| = n$ then the complete bipartite undirected graph denoted by $K_{m,n}$. See Figure for an example to the complete bipartite graph for $m = n$=3, $K_{3,3}$.

Example :- $G = (V(G), E(G), \psi_G)$ is an undirected graph, where

$$V(G) = \{z_1, z_2, z_3, z_4, z_5, z_6\}$$

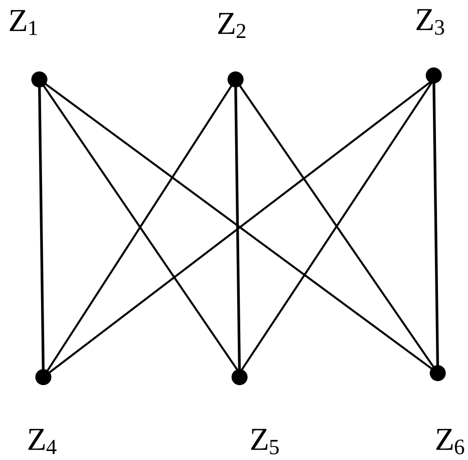
$$E(G) = \{e_1, e_2, e_3, e_4, e_5, e_6, e_7, e_8, e_9\}$$

and ψ_G is defined by

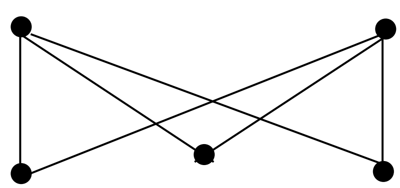
$$\psi_G(e_1) = z_1z_5, \quad \psi_G(e_2) = z_1z_4, \quad \psi_G(e_3) = z_1z_6,$$

$$\psi_G(e_4) = z_2z_4, \quad \psi_G(e_5) = z_3z_4, \quad \psi_G(e_6) = z_3z_6,$$

$$\psi_G(e_7) = z_2z_5, \quad \psi_G(e_8) = z_3z_5, \quad \psi_G(e_9) = z_2z_6,$$



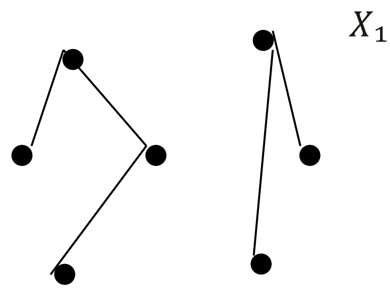
Example: to the complete bipartite graph for $m = 2$, n=3, $K_{2,3}$



5- K- Partite graph

In this graph we can partition the Vertex – set in to k- partite $\{X_1, X_2, \ldots, X_k\}$ such that in any edge in this graph , one end – Vertex in X_i and the other in X_j $(i \neq j)$

Example : 3- Partite



X_2

X_3

6- Complete K- Partite graph

The k- partite graph is called complete k- partite if any vertex in X_i adjacent with all vertices in $X_1, X_2, \ldots, X_{i-1}, X_{i+1}, \ldots, X_k$, denoted by $K_n(k)$.

Remark :

1) $\varepsilon(K_{m,n}) = m\,n$.

2) $\varepsilon\left(K_n(k)\right) = \frac{1}{2}\,k(k-1)n^2$.

7- n – Cube ($\boldsymbol{Q_n}$)

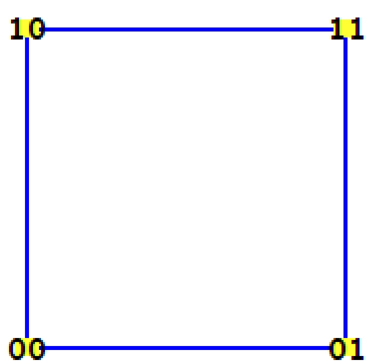
In this graph

$V(\boldsymbol{Q_n}) = \{\, x_1\, x_2 \ldots\, x_n : x_i \in \{0,1\}, i = 1,2,\ldots,n\}$

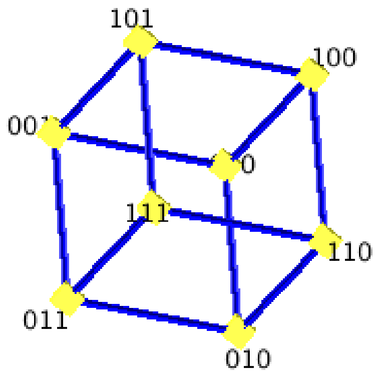
$E(\boldsymbol{Q_n}) = \{\, (x_1\, x_2 \ldots\, x_n\,, y_1\, y_2 \ldots y_n\,) : \sum_{i=1}^{n} |x_i - y_i| = 1 \,\}$, denoted by $\boldsymbol{Q_n}$.

Remark : $\nu\,(\boldsymbol{Q_n}\,) = 2^n$, $\boldsymbol{\varepsilon}\,(\boldsymbol{Q_n}\,) = \boldsymbol{n}\,2^{n-1}$

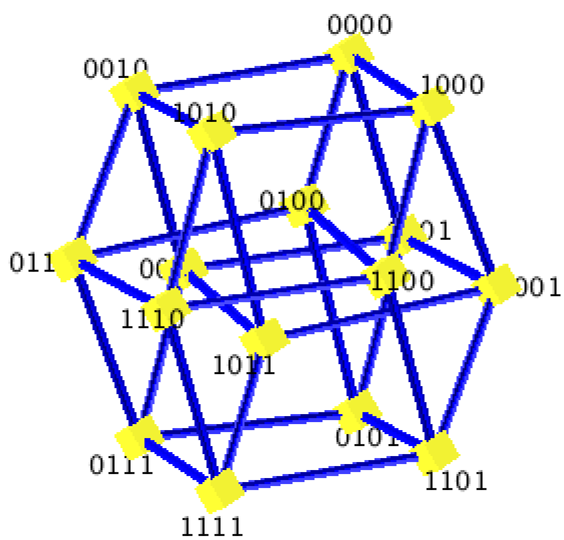
Example : $\boldsymbol{Q_1}$



$\boldsymbol{Q_2}$



Q_3



Q4

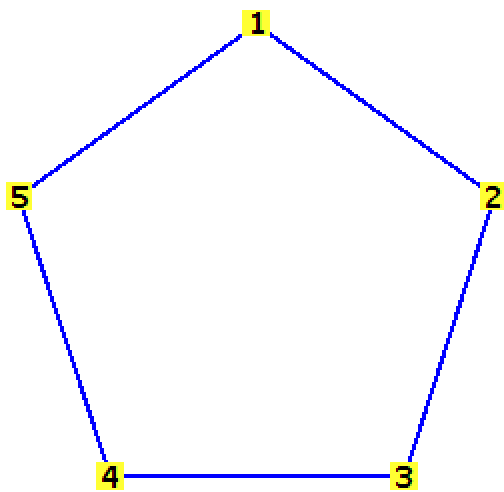
Theorem : The graph n- Cube is bipartite graph .

Proof:

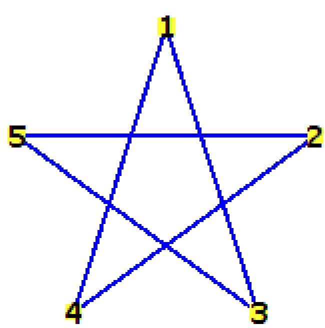
8- Complement graph

A graph $\boldsymbol{G^c}$ is called complement graph of the graph $\boldsymbol{G}$ if $V(\boldsymbol{G^c}) = \boldsymbol{V}(G)$ and $e\epsilon\ E(\ \boldsymbol{G^c}\ ) \leftrightarrow \boldsymbol{e}\ \notin E(G)$, (we write $\boldsymbol{G^c}$ $as\ \boldsymbol{G}'\ \boldsymbol{or}\ \overline{\boldsymbol{G}}$)

Example :



G



$\boldsymbol{G^c}$

Definition : If $G \cong \boldsymbol{G^c}$ then the graph G is called self-complementary .

Remark: Let D be a digraph such that

$V(D) = \{x_1, x_2,. \ .., x_n\}$

$E(D) = \{e_1, e_2, .., e_e\}$ but

$V(G) = \{ x'_1 , x''_1 , x'_2 , x''_2 , \dots , x'_n , x''_n \}$,

$E(G) = \{ \ = \{ x'_i \, x''_j \ : (x_i , x_j) \in E(D)\}$ the graph G is called associated bipartite undirected graph with D .

i.e. $\nu(G) = 2 \, \upsilon(D)$ and $\varepsilon \, (G) = \varepsilon(D)$.

$$E(G) = \{e_1, e_2, .., e_e\}$$