* For a graph to be Eulerian, the valencies of all nodes must be even numbers.
* For a graph to be Semi-Eulerian, the valencies of an even number of nodes must be even numbers.
* For a graph to be non-Eulerian, the valency of zero or one nodes can be even.
* For a graph to be Hamiltonian, there must be a cycle which uses every node exactly once (and ends on a node adjacent to where it started).
* For a graph to be Semi-Hamiltonian, there must be a path which uses every node exactly once.
* For a graph to be non-Hamiltonian, there must be no way of traversing the full graph visiting each node exactly once.

Below is a table with some brief explanations and examples justifying the graphs on the first page of this assignment.

|  |  |  |  |
| --- | --- | --- | --- |
| - | Hamiltonian | Semi-Hamiltonian | Neither |
| Eulerian | All valencies are even  Hamiltonian cycle: ABCDEFGHA | All valencies are even  Hamiltonian path: ABCHGFED | All valencies are even  Attempt at Hamiltonian path: ABCDED… |
| Semi-Eulerian | 2 valencies are even  Hamiltonian cycle: ABCDEFGHA | 2 valencies are even  Hamiltonian path: ABCHGFED | 2 valencies are even  Attempt at Hamiltonian path: ABCDED… |
| Neither | No valencies are even  Hamiltonian cycle: ABCDEFGHA | No valencies are even  Hamiltonian path:  ABCHGFED | No valencies are even  Attempt at Hamiltonian path: ABCDEFGF |