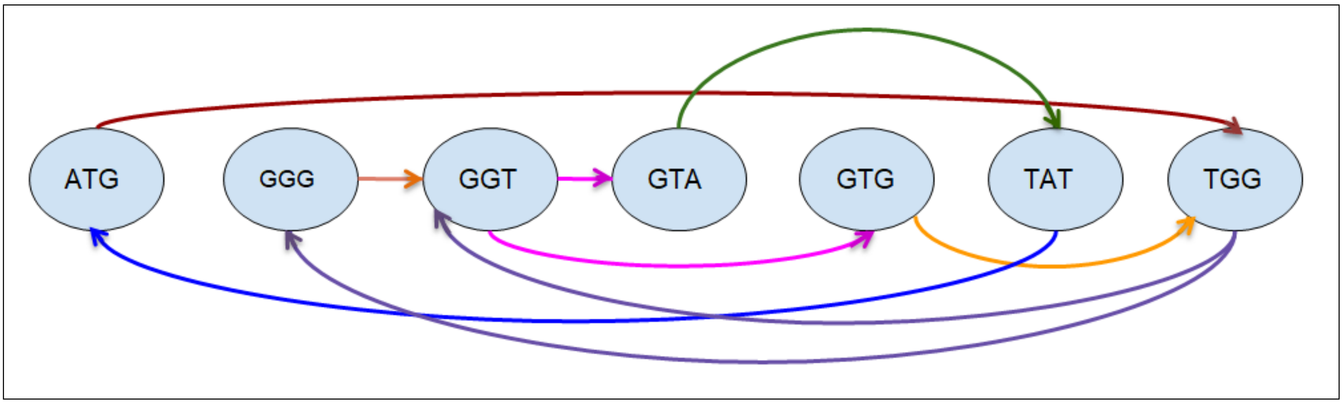
CAP 6515 ASSIGNMENT #4

1 Solution to Question No: 1

Spectrum, S=ATG, GGG, GGT, GTA, GTG, TAT, TGG

1.1 Hamiltonian Path Approach

The graph for the given spectrum is given below:



Hamiltonian Path is the path that visits all the vertices in a graph exactly once. All the possible paths in this graph are:

Starting from Vertex ATG:
ATG ← TGG ← GGG ← GGT ← GTA ← TAT ← ATG; ATG vertex visited more than once, so not a Hamiltonian path
ATG ← TGG ← GGG ← GGT ← GTG ← TGG; not a Hamiltonian Path
ATG ← TGG ← GGT ← GTA ← TAT ← ATG; not a Hamiltonian path
ATG ← TGG ← GGT ← GTG ← TGG; not a Hamiltonian path

Starting from Vertex GGG:
GGG ← GGT ← GTA ← TAT ← ATG ← TGG ← GGG; not a Hamiltonian Path
GGG ← GGT ← GTG ← TGG ← GGG; not a Hamiltonian Path
GGG ← GGT ← GTA ← TAT ← ATG ← TGG ← GGT; not a Hamiltonian Path
GGG ← GGT ← GTG ← TGG ← GGT; not a Hamiltonian Path

Starting from Vertex GGT:
GGT ← GTA ← TAT ← ATG ← TGG ← GGG ← GGT; not a Hamiltonian Path
GGT ← GTA ← TAT ← ATG ← TGG ← GGT; not a Hamiltonian Path
GGT ← GTG ← TGG ← GGG ← GGT; not a Hamiltonian Path
GGT ← GTG ← TGG ← GGT; not a Hamiltonian Path

Starting from Vertex GTA:
GTA ← TAT ← ATG ← TGG ← GGG ← GGT ← GTA; not a Hamiltonian Path
GTA ← TAT ← ATG ← TGG ← GGG ← GGT ← GTG; as all vertices visited so Hamiltonian Path
GTA ← TAT ← ATG ← TGG ← GGT ← GTG ← TGG; not a Hamiltonian Path
GTA ← TAT ← ATG ← TGG ← GGT ← GTA; not a Hamiltonian Path

Starting from Vertex GTG:
GTG ← TGG ← GGG ← GGT ← GTA ← TAT ← ATG; as all vertices visited so Hamiltonian Path
GTG ← TGG ← GGG ← GGT ← GTG; not a Hamiltonian Path
GTG ← TGG ← GGT ← GTA ← TAT ← ATG ← TGG; not a Hamiltonian Path
GTG ← TGG ← GGT ← GTG; not a Hamiltonian Path

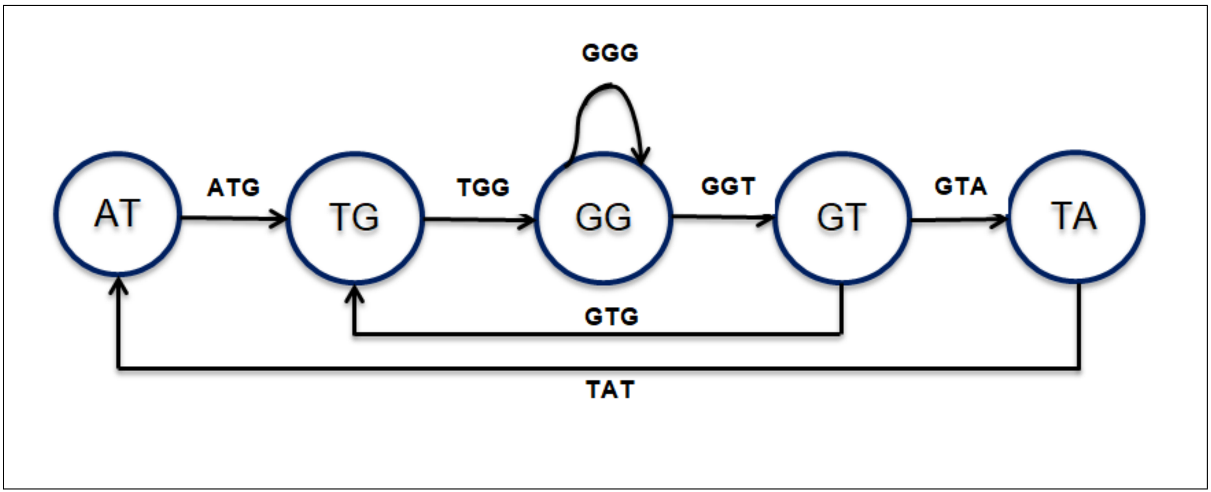
Starting from Vertex TAT:
TAT ← ATG ← TGG ← GGG ← GGT ← GTA ← TAT; not a Hamiltonian Path
TAT ← ATG ← TGG ← GGG ← GGT ← GTG ← TGG; not a Hamiltonian Path
TAT ← ATG ← TGG ← GGT ← GTA ← TAT; not a Hamiltonian Path
TAT ← ATG ← TGG ← GGT ← GTG ← TGG; not a Hamiltonian Path

Starting from Vertex TGG:
TGG ← GGG ← GGT ← GTA ← TAT ← ATG ← TGG; not a Hamiltonian Path
TGG ← GGG ← GGT ← GTG ← TGG; not a Hamiltonian Path
TGG ← GGT ← GTA ← TAT ← ATG ← TGG; not a Hamiltonian Path
TGG ← GGT ← GTG ← TGG; not a Hamiltonian Path

So, the possible sequences are:
GTATGGGTG
GTGGGTATG

1.2 Eulerian Path Approach

An Euclerian path is a path that visits all the edges only once.
Spectrum, S=ATG, GGG, GGT, GTA, GTG, TAT, TGG
So, vertices =AT, TG, GG, GT, TA



Starting from Edge ATG:
ATG ← TGG ← GGG ← GGT ← GTG ← TGG; as one edge visited more than once, so not Eulerian Path
ATG ← TGG ← GGG ← GGT ← GTA ← TAT ← ATG; not Eulerian Path

Starting from Edge TGG:
TGG ← GGG ← GGT ← GTG ← TGG; not Eulerian Path
TGG ← GGG ← GGT ← GTA ← TAT ← ATG; not Eulerian Path

Starting from Edge GGG:
GGG ← GGT ← GTA ← TAT ← ATG ← TGG ← GGG; not Eulerian Path
GGG ← GGT ← GTG ← TGG ← GGG; not Eulerian Path

Starting from Edge GGT:
GGT ← GTG ← TGG ← GGG ← GGT; not Eulerian Path
GGT ← GTA ← TAT ← ATG ← TGG ← GGG ← GGT; not Eulerian Path

Starting from Edge GTA:
GTA ← TAT ← ATG ← TGG ← GGG ← GGT ← GTG; as all the edges visited only once, so Eulerian Path
GTA ← TAT ← ATG ← TGG ← GGG ← GGT ← GTA; not Eulerian Path

Starting from Edge GTG:
GTG ← TGG ← GGG ← GGT ← GTA ← TAT ← ATG; as all the edges visited only once, so Eulerian Path

GTG ← TGG ← GGG ← GGT ← GTG; not Eulerian Path

Starting from Edge TAT:
TAT ← ATG ← TGG ← GGG ← GGT ← GTA ← TAT; not Eulerian Path
TAT ← ATG ← TGG ← GGG ← GGT ← GTG ← TGG; not Eulerian Path

So, the possible sequences are:
GTATGGGTG
GTGGGTATG