**Exam 2 Extra Credit – Sai Deepika Gopala, 002308462**

1. A ->aB |b |cBB

first(aB) = {a}

first(b) = {b}

first(cBB) ={c}

first(aB) ∩ first(b) ∩first(cBB) = Φ

So, the grammar rule passes pairwise disjointness test.

B -> ab | bA | aBb

First(ab) = {a}

First(bA) = {b}

First(aBb) = {a}

First(ab) ∩ first(bA) ∩ first(aBb) = Φ

So, the grammar rule passes pairwise disjointness test.

C -> aaA | b | caB

First(aaA) = {a}

First(b) = {b}

First(caB) = {c}

first(aaA) ∩ first(b) ∩first(caB) = Φ

So, the grammar rule passes pairwise disjointness test.

2. S 🡪 aSb | bAA

first(aSb) = {a}

first(bAA) = {b}

first(aSb) ∩ first(bAA)) = Φ

So, the grammar rule passes pairwise disjointness test.

A -> b{aB} | a

First(b{aB}) = {b}

First(a) = {a}

First(b{aB}) ∩ first(a) = Φ

So, the grammar rule passes pairwise disjointness test.

B -> aB | a

First(aB} = {a}

First(a) = {a}

first(aB) ∩ first(a) = a

So, the grammar rule fails the pairwise disjointness test.

3. S --> Aa | Bb

A 🡪 cA’ | bA’

A’ 🡪 aA’ | bcA’ | ε