**Section A**

a)

Let:

Since, we know that:

Therefore, there is exist 3 cubic roots of as follows:

b)

Let:

From Moivre’s theorem, we have:

Therefore,

Given that: where

Check whether or not the given function satisfied the Cauchy-Riemann equation:

Therefore, is differentiable if lies on the line or .

a)

b)

a)

b)

Using the definition of Laplace transform, we have:

Therefore,

# ****Section B****

Apply power series for analyzing this problem:

We have:

With , it holds that:

Therefore,

Given that:

Let , it holds that:

Taking Laplace transform both sides of , we obtain:

Thus, the current is:

Given that:

And

Let and , it holds that:

Taking Laplace transforms both side of the whole given system equations, we obtain:

Substitute into , we get:

Substitute back into , we get:

From and , taking inverse Laplace transforms to get the final result: