**Section A**

a)

We have:

b)

Let:

From Moivre’s theorem, we have:

Therefore,

a)

Let:

We have:

b)

Given that: where

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

Therefore, for all , exists. Then:

a)

In unit step function, is rewritten as follow:

Therefore,

b)

Given that:

Let , it holds that:

Taking Laplace transform both sides of , we obtain:

Thus, the solution of the given differential equation is:

# ****Section B****

We have:

By Kirchhoff voltage law:

Taking Laplace transform both sides, we obtain:

We have:

Therefore,

Thus, is harmonic function.

The harmonic conjugate for is