**SYSTEM OF FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS BY USING COMPLEX EFG TRANSFORM**

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Abstract:

Recently Kuffi, Karaaslan and sadkhan developed EFG integral transform. We apply EFG transform for solving system of first order differential equations. Key words: Integral transform, System of differential equation, Ordinary differential equation.

1. **Introduction:**

Integral transforms plays very important role in differential equations. Now a day’s lot of researchers are interested and engaged in developing new integral transform and using those in different types of differential, integral as well as integro-diffrential equations and their systems.

Recently Kushare transform [2] and Soham transform [3] are introduced by Kushare, Khakale and Patil. Kuffi et al introduced Complex EFG transformation [1] (2022). Patil [4, 5, 6, 7, 8, 9] used various integral transforms for solving various systems of differential equations.

In this paper we use EFG transform for solving first order system of differential equations.

1. **Priliminary:**

In this section we state some definitions , properties and formulae of complex EFG transform which are required to solve the system of ordinary differential equations of first order.

**Definition [1]** : The complex EFG transform for the function of exponential order in set b which is defined asb ={f(t) : there exist m, L1, L2 > 0} ,

where, , m is finite for a particular function in the set bwhile L1&L2may be finite or infinite

The complex EFG transform is denoted by{} and is defined as

(f(t))= dt = f (iv) t0, L1q (v)L2

**Table 1: Formulae Complex EFG integral transform for some basic functions.**

|  |  |  |
| --- | --- | --- |
| Sr. No. | Function | EFG Transform |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 | sin(at) |  |
| 8 | cos(at) |  |
| 9 | sinh(at) |  |
| 10 | cosh(at) |  |

**P****roperties:[1]**

**Property 1:** If then

=

=

**Property:2. Shifting property for the EFG transform**

If then; , where is a constant.

**Theorem**: Transform of derivatives [1]

Let F(v) be the Complex EFG transform of the f(t) then = - f(0) + iq(v). F(iv)

Linearity Property: If f(t) and g(t) are two functions then,

where α and β are arbitrary constant

1. **Applications for system of equation**

In this section we use Complex EFG transform to solve following first order system of differential equation.

Example:1 Consider the system of differential equations.

(2)

With the given initial condition x(0) =1 and y(0)=1

By using EFG transform to equation (1) and equation (2),

Using initial conditions,

i.e.

Multiplying equation (3) by iq(v) and equation (4) by 1and subtracting,

{y}=(since

Now applying inverse complex EFG transform we obtain

From equation 3

(since )

By using inverse complex EFG transform, we obtain

Required solution is and .

Example:2 Consider system of differential equation

With the given initial condition x(0)=0 & y(0)=1

By using EFG transform

}

We solve equations (3) and (4),

[

By using inverse complex EFG transform we get,

From equation 4

= [

By using inverse EFG transform,

It is the required solution.

**CONCLUSION:** We applied Complex EFG integral transform for solving the first order system of ordinary differential equations successfully. Answers obtained by using Complex EFG integral transform are same as obtained by other methods.

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