**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 to solve 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 to solve 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  |   | q(v) |
|  2  |   |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |
| 7 | sin(at) |  |
| 8 | cos (at) |  |
| 9 | sinh (at) |  |
| 10 | cosh (at) |  |

**Properties:[1]**

**Property 1:** If then

 =

 =

**Property:2. Shifting property for the Complex 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 system of differential equations of first order .

Example:1 Consider the system of differential equations.

(2)

With 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

{x}= (since

By using inverse complex EFG transform, we obtain

Required solution is and .

Example:2 Consider system of differential equation

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

By using EFG transform

}

We solve equations (3) and (4),

[

By using inverse EFG transform we get,

From equation 4

=

By using inverse EFG transform,

It is the required solution.

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

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