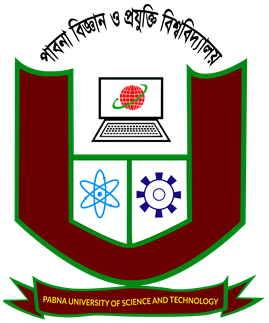
**Pabna University of Science and Technology**



Department of Computer Science and Engineering

Faculty of Engineering and Technology

**Course Code:** MATH 1201

**Course Title:** Integral Calculus, Differential Equation and Series Solution

Assignment : Linear ODE

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# Linear Ordinary Differential Equation:

An **ordinary differential equation** involving no product of the dependent variable and/or its derivative or transcendental function of the dependent variable is called a **linear O.D.E**.

1. no product of the dependent variable  
   i.e. etc.
2. no product of the dependent variable and its derivative  
   i.e. etc.
3. no product derivative of the dependent variable  
    etc.
4. Transcendental function of the dependent variable  
   e.g.   
    etc.

## Examples:

1. *3rd order 1st degree L.O.D.E.*
2. *2nd order 1st degree non-linear*
3. *1st order 1st degree non-linear*

# Integrating Factor:

A non-exact ordinary differential equation is multiplied by a factor to make it exact ordinary differential equation, then it is called an integrating factor. It is defined as,

Non-exact O.D.E🡪 Integrating factor🡪 Exact O.D.E

First Order Linear O.D.E:

An equation of the form is called first order linear ordinary differential equation.

## General equation:

**Example 01:** Solve

**Solve:**

This is the first order O.D.E

So,

IF

Now multiplying equation (1) by integrating factor, we get

Integrating equation (2), we have

where c is an arbitrary constant which is the required general solution.

**Example 02:** Solve

**Solve:**

This is a first order linear O.D.E

IF

Now multiplying equation (1) by integrating factor, we get

Integrating equation (2), we have

where c is an arbitrary constant which is the required general solution.

**HOMEWORK**

**Problem-1.**

**Solution:**

Here, ,

And I. F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation(2), we obtain

where c is an arbitrary constant which is the required general solution.

**Problem-2.**

**Solution:**

Here, ,

And I. F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

where c is an arbitrary constant which is the required general solution.

**PROBLEM-3.**

**solution:**

Here, ,

And I. F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

where c is an arbitrary constant which is the required general solution.

**PROBLEM-4.**

**Solution:**

Here, ,

An I.F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

where c is an arbitrary constant which is the required general solution.

**PROBLEM-5.**

**Solution:**

Here, ,

An I.F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

where c is an arbitrary constant which is the required general solution.

**PROBLEM-6.**

**Solution:**

Here, ,

An I.F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

where c is an arbitrary constant which is the required general solution.

**PROBLEM-19.**

**Solution:**

Here, ,

An I.F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

We apply the I.C let , In (3) to obtain

Thus and the solution of the stated I.V.P is

**PROBLEM-20.**

**Solution:**

Here, ,

An I.F is

We multiply the D. E (1) through by this I. F to obtain

Integrating equation (2), we obtain

We apply the I.C let , In (3) to obtain

Thus and the solution of the stated I.V.P is