

North Gauhati College
Department of Mathematics

SEMESTER II(MAJOR)
HOME ASSIGNMENT

M-205(Non-CBCS)
Differential Equations

October 2021

TOTAL MARKS: 30

INSTRUCTIONS TO CANDIDATES

1. This assignment paper contains **Three (3)** questions and comprises **Three (3)** printed pages.
2. Answer all questions. The marks for each question are indicated at the beginning of each question.
3. Submit the assignment as a single **PDF** file through the online portal of our college website under section “Assignments”.
4. Write your **Name, GU Roll No., and Registration Number** in the assignment .
5. Submission **Due Date** is on or before **8th October, 2021**.

Question 1.

[1+2+3+4=10]

- (i) When is a differential equation said to be exact?
 (ii) Is the equation

$$(x^2 + 2xy^2)dx + (2x^2y + y^2)dy = 0$$

exact? Solve it.

- (iii) Show that $e^{\int Pdx}$ is the integrating factor of the linear differential equation

$$\frac{dy}{dx} + Py = Q,$$

where P, Q are functions of x alone or constants.

Question 2.

[1+4+5=10]

- (i) Write down the general form of a first-order linear ordinary differential equation.
 (ii) Solve the initial-value problem that consists of the differential equation

$$(x^2 + 1)\frac{dy}{dx} + 4xy = x$$

and the initial condition $y(2) = 1$.

- (iii) Find the solution of the Bernoulli differential equation

$$\frac{dy}{dx} + y = xy^3.$$

Question 3.

[2+4+4=10]

- (i) Write down the general form of a linear differential equation of nth order.
- (ii) Solve using method of variation of parameters

$$(x^2 + 1)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + 2y = 6(x^2 + 1)^2.$$

- (iii) Solve:

$$\frac{d^2y}{dx^2} - 2\frac{dy}{dx} - 3y = 2e^x - 10 \sin x.$$

END OF PAPER