North Gauhati College
Department of Mathematics

SEMESTER I(HONOURS)
HOME ASSIGNMENT 2022

MAT-HC-1016
Calculus

January 2022 TOTAL MARKS: 30

INSTRUCTIONS TO CANDIDATES

1. This assignment paper contains **Eight (8)** questions and comprises **Two (2)** printed pages.
2. Each question carry **Five** marks. Answer any **Six** of all questions.
3. Submit the assignment as a single **PDF** file through the online portal of our college website under section "Assignments" and submit a hard copy in the Department of Mathematics.
4. Write your **Name**, **GU Roll No.**, and **Registration Number** in the assignment .
5. Submission **Due Date** is on or before 28th January, 2022.

(*Answer any* ***Six***)

1. Sketch the graph of $f(x) = 4 + \frac{2x}{x-3}$.

2. Determine whether the graph of the given function has a vertical tangent or a cusp, where $f(x) = x^{\frac{1}{3}}(x+4)$.

3. Show that $\lim_{x\to\infty}\left(1+\dfrac{1}{x}\right)^{\frac{1}{x}} = e$.

4. Obtain the reduction formula for $\int \sin^m x \cos^n x dx$.

5. Verify Green's theorem in the plane for $\oint_C \left(xy+y^2\right)dx + x^2dy$ where C is the closed curve of the region bounded by $y = x$ and $y = x^2$.

6. Evaluate $\iint_S (ax^2 + by^2 + cz^2)\,ds$ over the surface $x^2 + y^2 + z^2 = 1$ using the divergence theorem.

7. Write down the physical interpretation of divergence and curl.

8. For any closed surface S, prove the following:

   a. $\iint_S \hat{n}ds = 0$

   b. $\iint_S \overrightarrow{r} \times \hat{n}ds = 0$

END OF PAPER