ASSIGNMENT

NORTH GAUHATI COLLEGE

Department of Physics

2nd Semester Physics Major (Non-CBCS)

Paper code: 201, Mathematical Methods-II & Properties of matter

Total Marks: 30

(The figures in the margin indicate the full marks for the questions)

1. Show that the integral $\int_{(1,2)}^{(3,4)} (xy^2 + y^3)dx + (x^2 y + 3xy^2)dy$ is independent of the path joining the points (1, 2) and (3, 4). Hence evaluate the integral. 2+1=3
2. Verify Green's theorem in plane for $\int_c (x^2 + 2xy)dx + (y^2 + x^3 y)dy$ where '*c*' is a square with the vertices P (0, 0), Q (1, 0), R (1, 1) and S (0, 1). 4
3. Apply Stock's theorem to calculate $\int 4ydx + 2zdy + 6ydz$ where '*c*' is the curve of intersection of $x^2 + y^2 + z^2 = 6z$ and $z = x + 3$. 4
4. Verify Divergence theorem, given that $\vec{F} = 4xzi - y^2 j + yzk$ and '*S*' is the surface of the cube bounded by the planes $x = 0, x = 1, y = 0, y = 1, z = 0, z = 1$. 5
5. Express $xi + 2yj + yzk$ in spherical polar co-ordinates. 4
6. Prove that $\int_0^1 \left(\log \frac{1}{y}\right)^{n-1} dy = \Gamma n$ 2
7. Derive an expression for the twisting couple per unit twist of a rod of length '*l*', radius '*r*' and rigidity of modulus '*η*' fixed at one end. 4
8. Calculate the work done against surface tension in blowing a soap bubble from a radius of 10 cm to 20 cm, if the surface tension is 25×10^{-3} N/m. 4

Nota Bene:

- Write your answers in A4 paper sheet mentioning clearly **your name, GU roll number, registration number, paper code etc.** at the front page of your answer sheet.
- You have to make a single PDF file of your answer sheets.
- You need to submit your respective PDF at the online portal of our college website or at the mail id: ngcphysicsdept@gmail.com.
- The submission due date is on or before **19th October, 2021**