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National Institute of Technology Goa

B.Tech. Minor Examination, April-2021

Department of Humanities and Sciences

Course Name: **MATHEMATICS-I (A & B)** Course Code: MA100

Date: April 2, 2021 Time: 11:00 AM

Duration: 40 Min. Max. Marks: 25

ANSWER ALL QUESTIONS

1. Find the work done in moving a particle once around a circle C in the xy plane, if the circle has center at the origin and radius 3 and if the force field is given by $F = (2x - y + z)i + (x + y - z^2)j + (3x - 2y + 4z)k$.

2. (a) Show that $F = (2xy + z^3)i + x^2j + 3xz^2k$ is a conservative force field.

   (b) Find the scalar potential.

3. Find the area of the region cut from the plane $x + 2y + 2z = 5$ by the cylinder whose walls are $x = y^2$ and $x = 2 - y^2$.

4. Find the flux of the field $F(x, y, z) = 4xi + 4yj + 2k$ outward (away from the z-axis) through the surface cut from the bottom of the paraboloid $z = x^2 + y^2$ by the plane $z = 1$.

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

$***$ ALL THE BEST $***$