

Q. NO. 1

- (a) Find limit (if exists)

$$\lim_{(x,y) \rightarrow (0,0)} \frac{2xy}{3x^2 + y^2}$$

- (b) Find relative extrema of

$$f(x,y) = -x^2 - 5y^2 + 8x - 10y - 13$$

- (c) Evaluate

$$\int_0^1 \int_0^{\sqrt{1-x^2}} \frac{dx dy}{1+x^2+y^2}$$

Q. NO. 2

- (a) Give an example of bounded fn. which is not Riemann Integrable.

- (b) Prove that every metric space is Hausdorff. Also give an example of space which is not Hausdorff.

Q. NO. 3

- (a) Prove that every compact space is complete but converse is not true.

- (b) Check whether CR-equations for
- $f(z) = z^2$
- are satisfied or not. Also evaluate

$$\oint_C \frac{e^z}{z^3} dz \quad ; \quad C \ni |z| = 1$$

Q. NO. 4

Give an example of non-abelian group of order 12. Also prove that it is indeed a group.

Q. NO. 5

Find matrix representation of $L: \mathbb{R}^2 \rightarrow \mathbb{R}^2$ w.r.t. order basis $B = \{(1,1), (1,-1)\}$ s.t. L rotates every vector through an angle of $\frac{\pi}{4}$ rad in anticlockwise direction.

$$\pi \text{ is not a } \infty$$