SHIVAJI COLLEGE, UNIVERSITY OF DELHI

DEPARTMENT OF Mathematics

INTERNAL TEST (Academic Year 2023-24)

Name of the Course : BSc (H) Mathematics
Semester : IV
Name of the Paper : Multivariate Calculus
Faculty Name : Dr. BABITA GUPTA
Duration : 1 hr
Maximum Marks: 12
Date of Test : 29|04|24

Attempt any 5 questions.

1. Let f be the function given by

$$f(x,y) = \begin{cases} \dfrac{xy^2}{x^2+y^4}, & (x,y) \neq (0,0) \\ 0, & (x,y) = (0,0) \end{cases}$$

Is f continuous at $(0,0)$? explain.

2. In what direction is the function defined by

$$f(x,y) = xe^{2y-x}$$

increasing most rapidly at the pt $(2,1)$ and what is the maximum rate of increase.

3. Find the absolute extrema of $f(x,y) = xy - 2x - 5y$ on triangular region with vertices $(0,0)$, $(7,0)$ and $(7,7)$.

4. Sketch the region and compute the double integral

$$\iint_D (x+y)\,dA \; ; \text{ where } D \text{ is triangle with vertices } (0,0),$$

$(0,1)$ and $(1,1)$.

5. Evaluate the given integral by converting to polar coord.

$$\int_0^3 \int_0^{\sqrt{9-x^2}} x \, dy \, dx$$

6. Find the volume of the solid bdd by $z=2$ and $2z = x^2+y^2$.

Faculty Signature:

Babita.

SHIVAJI COLLEGE, UNIVERSITY OF DELHI

DEPARTMENT OF MATHEMATICS

INTERNAL TEST (Academic Year 2023-24)

Name of the Course : BSc(H) Mathematics
Semester : Even
Name of the Paper : Multivariate Calculus
Faculty Name :Babita Gupta
Duration : 1Hour
Maximum Marks: 12
Date of Test : 11/03/24

Attempt any 5 questions

1. Show that $\lim_{n\to\infty} \frac{x^2-y^2}{x^2+y^2}$ does not exist.
2. For $f(x,y) = x^2y + y^3x^2 + \cos(x^2)$ determine f_x , f_y *and* f_{xy}.
3. Write the equation of tangent plane to the surface $Z = 10 - x^2 - y^2$ at (2,2,2)
4. If $Z = f(u - v, v - u)$ prove that

$$\frac{\partial z}{\partial u} + \frac{\partial z}{\partial v} = 0$$

5. The directional derivative of f(x,y,z) at the point P_0 is greatest in the direction of $v = i + j - k$ and has value $5\sqrt{3}$ in this direction. What is the directional derivative of f in the direction of $w = i + j$.
6. For $f(x,y) = -x^3 + 9x - 4y^2$ find the critical points and identify as relative maximum, relative minimum or saddle point.
7. Determine the total differential for $f(x,y) = \cos(x^2y)$.

Faculty Signature: