P. S. SCIENCE & H. D. PATEL ARTS COLLEGE, KADI

Internal Examination

B. Sc. Semester - III

22-9-2016] **C. C. Mathematics - 301** [2 Hours

Calculus and Linear Algebra

---

1. [A] If function $z = f(x, y)$, defined on an open set $E \subset R^2$, is differentiable point $(x, y) \in E$, then its partial derivatives f_x and f_y exits at point (x, y).

[B] **Attempt any two**

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

determine the value of $xf_x + yf_y$.

(ii) If $H = f(y - z, z - x, x - y)$ then Prove that $H_x + H_y + H_z = 0$

(iii) If $u = x \log y + y \log x$ then prove that $u_{xy} = u_{yx}$.

2. [A] If f is a differentiable homogeneos function of x and y of degree m then prove that $xf_x + yf_y = mf(x, y)$

[B] **Attempt any two**

(i) if $u = \tan^{-1}\left(\dfrac{x^3 + y^3}{x - y}\right)$ then Prove that $x\dfrac{\partial u}{\partial x} + y\dfrac{\partial u}{\partial y} = \sin 2u$

(ii) Find the Talor's expansion of $e^{ax} \cos by$ about $(0, 0)$ upto and including the terms of 2^{nd} degree.

[P.T.O.

(iii) Discuss the extreme value of the function

$f(x, y) = x^2y^2(1 - x - y)$

3. [A] Define vector Space with illustration.

[B] **Attempt any two**

(i) Check the following subsets of R^3 is Subspce or not ?

$u = \{(a, a_2, a_3) / a_1 - 2a_2 + a_3 = 0\}$

(ii) If $e_1 = (3, 2, 1)$, $e_2 = (2, 1, 0)$, $e_3 = (1, 0, 0)$ be three vectors in IR^3, then express the vector $(3, 5, 2) \in IR^3$ as a linear combination of e_1, e_2, e_3

(iii) Show that the vector (1 ,2, 3) belongs to

$[\{(2, 1, 0), (3, 0, -1), (-2, 5, 0)\}]$
