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

Internal Examination

B. Sc. Semester - III

5-10-2015] **C. C. Mathematics - 301** **[1-30 to 3-00**

Calculus and Linear Algebra

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1. [A] Define Continuity

Discuss the continuity of the function

$$f(x, y) = \begin{cases} \tan^{-1}\left(\frac{y}{x}\right) & , x \neq 0 \\ 0 & , x = 0 \end{cases}$$

[B] **Attempt any two**

(i) Evaluat f_x and f_y for the function

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

(ii) Find fxy (0, 0) for the function

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

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

2. [A] Define Homogeneous function If $u = \cos^{-1} \frac{x^2 + y^2}{x + y}$,

$x + y \neq 0$ then P.T. $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} = -\cot x$

[P.T.O.

[B] Attempt any two

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

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

(iii) Expand $x^3 + xy^2$ in power of (x - 2) and (y - 1)

3. **[A]** Define vector Space P.T. $(R^+, +, \cdot)$ is a vector space where $+ : R^+ \times R^+ \rightarrow R^+$

for $x, y \in R^+$ $x + y = xy$

$\cdot : F \times R^+ \rightarrow R^+$

for $a \in F, x \in R^+$ $\alpha - x = x^\alpha$

[B] Attempt any two

(i) Check the following subsets of R^3 os Subspce or not:

$u = \{(a, a_2, a_3) / a1 - 2\, a_2 + a_3 = 0\}$

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

(iii) Prove that the Set {(1, 2, 1), (2, 1, 0), (1, -1, 2)} form a basis for R^3.
