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Total No. of Printed Pages: [01]

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**B.Sc. (Forensic Science) (Semester – 1<sup>st</sup>)**

**DIFFERENTIAL CALCULUS-I**

**Subject Code: BSNMS1105**

**Paper ID: [23480108]**

**Time: 03 Hours**

**Maximum Marks: 60**

**Instruction for candidates:**

1. Section A is compulsory. It consists of 10 parts of two marks each.
2. Section B consist of 5 questions of 5 marks each. The student has to attempt any 4 questions out of it.
3. Section C consist of 3 questions of 10 marks each. The student has to attempt any 2 questions.

**Section – A**

**(2 marks each)**

Q1. Attempt the following:

- a. Evaluate  $x \sin(\frac{1}{x})$
- b. Examine the function for continuity:  $f(x) = 1/x$  ,  $x > 0$  and  $f(x) = x$  ,  $x \leq 0$  at  $x = 0$
- c. Define Implicit Function.
- d. Evaluate Jacobian of  $f(x,y,z) = (x^2 + y^2 + z^2, y^2 + z^2, z^2)$
- e. State Rolle's Theorem
- f. Find the asymptotes parallel to the axes of the curve  $x^2y^2 + y^2 = 1$
- g. Define Singular Points.
- h. Find the equation of tangent and Normal of the curve  $y = x^3$  at  $(1,1)$
- i. Evaluate  $(1 - \cos^2 x) / \sin x^2$
- j. Define Maxima and Minima.

**Section – B**

**(5 marks each)**

- Q2. Find the second order partial derivative of  $f(x,y) = x^2 \sin(x+y)$
- Q3. Show that  $f(x) = (x-a)^m (y-b)^n$  ,  $m$  &  $n$  being the integers, satisfies Rolle's theorem in  $[a,b]$ . Find the value of  $c$ .
- Q4. State and Prove Euler's Theorem.
- Q5. Find the radius of convergence at any point of the curve,  $x = a(t - \sin t)$  ,  $y = a(1 - \cos t)$
- Q6. If  $\sqrt{x} + \sqrt{y} = \sqrt{a}$  , Find the value of its second derivative at  $x = a$

**Section – C**

**(10 marks each)**

- Q7. State and Prove Leibnitz Theorem
- Q8. State and Prove Taylor's Theorem with Lagrange form of Remainder.
- Q9. Trace the Curve  $x = (y-1)(y-2)(y-3)$