Roll No…….. **Total No. Printed Pages: [01]**
Total No. of Questions: [09]

B.Sc.-M.Sc. (Forensic Science) (Semester: 1st)
DIFFERENTIAL CALCULUS-II
Subject Code: BSNMS1106
Paper ID: 23480109

Time: 03 Hours **Maximum Marks: 60**

Instructions for candidates:

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

Section – A **(2 marks each)**

Q1. Attempt the following:

a. Find local maxima and minima of function $f(x, y) = x^2 + xy + y^2 - 3x$.

b. Find the unit normal to the surface $xy + yz + zx = c$ at the point $(-1, 2, 3)$.

c. Suppose $y = \log log\, x$; what is the length of this curve between $x = 1$ and $x = \sqrt{3}$?

d. Calculate the area under the curve of a function, $f(x) = 7 - x^2$; the limit is given as $x = -1$ to 2.

e. Find the integration of $\int \frac{x^2}{x^2-9} dx$.

f. Evaluate $\int_{-1}^{2} |x| dx$

g. Write the reduction formula for $\int x^n \sin sin\,(x)\, dx$.

h. Evaluate $\int\int \left(x^2 + y^2\right) dxdy$.

i. Change order of integration and evaluate $\int_0^1 \int_x^1 e^{y^2} dydx$.

j. Evaluate the integral: $\int \frac{x^2+1}{x^2-5x+6} dx$.

Section – B **(5 Marks each)**

Q2. Find the equation of tangent plane to the surface $z = 3x^2 - xy$ at point $(1, 2, 1)$.

Q3. Find the area under cardioid defined by the equation $r = 1 - \cos cos\, \theta$.

Q4. Evaluate $\int (2x)\, dx$.

Q5. Consider the integral $\int_0^2 \int_0^{\sqrt{2x-x^2}} \sqrt{x^2 + y^2} dydx$. Use the change of variables $x = r \cos cos\, \theta$, $y = r \sin sin\, \theta$ and evaluate the integral.

Q6. Evaluate the triple integral $\iiint_B x^2 yz dV$,
where $B = \{(x, y, z) | -2 \leq x \leq 1, 0 \leq y \leq 3, 1 \leq z \leq 5$.

Section – C **(10 Marks each)**

Q7. Find the minimum value of $f(x, y, z) = x^2 + y^2 + z^2$ subject to the condition $\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 1$.

Q8. Find the volume of the solid obtained by rotating the region $0 \leq x \leq 1,\ 0 \leq y \leq x$ around the y-axis.

Q9. Derive the reduction formula for $\int x\, dx$.