Roll No. | | | | | | | | | | | | | **Total No. of Pages : 02**

Total No. of Questions : 09

B.Sc. (Non Med.) (Sem.–1)

DIFFERENTIAL CALCULAS

Subject Code : BSNM-105-18

M.Code : 75746

Date of Examination : 21-01-23

Time : 3 Hrs. **Max. Marks : 50**

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying ONE marks each.**
2. **SECTION-B contains FIVE questions carrying FIVE marks each and students have to attempt any FOUR questions.**
3. **SECTION-C contains THREE questions carrying TEN marks each and students have to attempt any TWO questions.**

SECTION-A

1. Write briefly :

a) State Oscillatory sequence.

b) Define range of a sequence.

c) Find $L_{x \to +\infty} (7x^3 + 8x^2 + 5x - 7)$.

d) Find $\lim \frac{7x+1}{x+3}$ when x tends to -3.

e) Find the derivative of cos2x.

f) State Euler's theorem.

g) State Implicit function.

h) Define piecewise continuity.

i) State Mean value Theorem.

j) If $f = x^2y + xy^2$, Find $\frac{\partial f}{\partial y}$.

SECTION-B

2. Prove that the sequence $\left[\frac{n^3}{n^3+1}\right]$ is a Cauchy sequence.

3. Prove that the function $f(x) = \cos x$ is continuous for every value of x.

4. Find $\frac{dy}{dx'}$, when $y = 3\cos t - 2\cos^2 t$, $y = 3\sin t - 2\sin^2 t$.

5. Find u_{xy} and u_{yx} if $u = \tan^{-1}\frac{y}{x}$.

6. If $U = f\left(\frac{x}{y}, \frac{y}{z}, \frac{z}{x}\right)$. Prove that $xU_x + yU_y + zU_z = 0$

SECTION-C

7. Using Lagrange's Mean value theorem show that $\frac{x}{1+x} < \log(1+x) < x \ \forall\ x > 0$. Hence show that $0 < [\log(1+x)]^{-1} - x^{-1} < 1 \ \forall x > 0$.

8. If $\tan u = \frac{x^3 + y^3}{x - y}$, prove $x^2\frac{\partial^2 u}{\partial x^2} + y^2\frac{\partial^2 u}{\partial y^2} + 2xy\frac{\partial^2 u}{\partial x \partial y} = 4(\sin u \cos 3u)$.

9. a) Discuss the continuity of the function $f(x) = [[x]] - [x - 1]$ where [ ] denotes the greatest integral function.

   b) Evaluate $\lim_{x \to 0}\left\{\tan\left(\frac{\pi}{4} + x\right)\right\}^{\frac{1}{x}}$.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.