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

Total No. of Questions : 09

B.Sc Non Medical (2018 Batch) (Sem.–1)

DIFFERENTIAL CALCULUS

Subject Code : BSNM-105-18

Paper ID : [75746]

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. Answer briefly :

a) Define convergent sequence.

b) Discuss the convergence or divergence of the series $\sum \frac{\sqrt{n}}{n^2+1}$.

c) What do you mean by sequence of nested intervals?

d) By using definition of limit, show that $\lim_{x\to 2}(4x-5)=3$.

e) Find $\frac{dy}{dx}$ when $cot^{-1}(x/y)+y^3+1=0, x>0, y>0$.

f) If z=f(x+ay)+g(x-ay), prove that $= \frac{\partial^2 z}{\partial y^2} = a^2\frac{\partial^2 z}{\partial x^2}$.

g) Evaluate $\frac{\partial(f,g)}{\partial(x,y)}$ if $f=x^2-x\sin y,\ g=x^2y^2+x+y$.

h) Using differentials find the approximate value of cos 44° sin 32°.

i) State Cauchy mean value theorem.

j) What do you mean by greatest lower bound of a sequence? Give an example.

SECTION-B

2. Discuss the convergence of series $\sum\left(\sqrt{n^2+1}-n\right)$.

3. If $w = z\ln y + y\ln z, \quad x = sint, y = t^2+1, \; z = cos^{-1}t$. Find $\frac{dw}{dt}$ at $t = 0$.

4. Prove that $\lim_{x\to 0}\frac{e^x-1}{x}=1$.

5. If $u^3 = xyz, \frac{1}{v}=\frac{1}{x}+\frac{1}{y}+\frac{1}{z}$ *and* $w^2 = x^2+y^2+z^2$.

   Prove $\frac{\partial(u,v,w)}{\partial(x,y,z)} = -\frac{v(y-z)(z-x)(x-y)(x+y+z)}{3u^2w(yz+zx+xy)}$.

6. Prove that $f(x) = x^2$ is uniformly continuous in [0, 1].

SECTION- C

7. State and prove Cauchy convergence criterion.

8. State Lagrange's mean value theorem. Discuss the applicability of Lagrange's mean value theorem to $f(x) - cosx \ln\left[0, \frac{\pi}{2}\right]$.

9. If $z = f(u,v)$ where $u = e^x cosy, v = e^x siny,$ show that $\frac{\partial^2 z}{\partial x^2}+\frac{\partial^2 z}{\partial y^2} = \left(u^2+v^2\right)\left(\frac{\partial^2 z}{\partial u^2}+\frac{\partial^2 z}{\partial v^2}\right)$.