K19U 3007

Reg. No. : .....

Name : .....

I Semester B.Sc. Hon's (Mathematics) Degree (Reg./Suppl./Imp.) Examination, November -2019

(2016 Admission Onwards)

BHM 103 : DIFFERENTIAL CALCULUS

Time : 3 Hours Max. Marks : 60

Section - A

Answer any **4** questions out of 5 questions. Each question carries **1** mark. **(4×1=4)**

1. Define the slope of a curve.
2. Find $\lim_{x\to 2}(4)$ = _____
3. Define a point of inflection of the graph of a function.
4. Find $\int \tan x\,dx$.
5. When we say that a function $f(x,y)$ has a local maximum at (a,b).

Section - B

Answer any **6** questions out of 9 questions. Each question carries **2** marks. **(6×2=12)**

6. Find $\lim_{t\to 0}\frac{\tan t \sec 2t}{3t}$.
7. State Rolle's theorem for functions.
8. State second derivative test for concavity.
9. Find the n^{th} derivative of $y = a^{mx}$.
10. Evaluate $\int_0^2 \frac{2x\,dx}{x^2-5}$.

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11. Find $\lim_{x\to 0}\frac{1-\cos x}{x+x^2}$.

12. Find f_x if $f(x,y)=2y/ye^{\cos x}$.

13. Find $\frac{dy}{dx}$ if $x^2+\sin y-2y=0$.

14. Show that every polynomial is continuous.

Section - C

Answer any **8** questions out of 12 questions. Each question carries **4** marks. **(8×4=32)**

15. Discuss the behaviour of the following function as $x\to 0$.

$$f(x)=\begin{cases}0, & x<0\\ 1, & x\geq 0\end{cases}.$$

16. Show that the function $y=\left|\frac{x-2}{x^2-2}\right|$ is continuous everywhere.

17. Find the values c for the function $f(x)=x^2+2x-1$ defined on $[0,1]$ using mean value theorem.

18. Determine the concavity of $y=x^3$ on $(-\infty,\infty)$.

19. If $I_n=\frac{d^n}{dx^n}(x^n\log x)$. show that $I_n=nI_{n-1}+(n-1)$.

20. If $y^{1/m}+y^{-1/m}=2x$, show that $(x^2-1)y_{n+2}+(2n+1)xy_{n+1}+(n^2-m^2)y_n=0$.

21. Evaluate $\int_0^1 \sinh^2 x\,dx$.

22. Show that $\lim_{x\to 0^+}(1+x)^{1/x}=e$.

23. Evaluate $\int_0^{\pi/6}\tan 2x\,dx$.

24. Find $f_x\ f_y\ f_z$ if $f(x,y,z)=1+xy^2-2z^2$.

25. Find $\frac{\partial w}{\partial r}$ and $\frac{\partial w}{\partial s}$ in terms of $\rightarrow$r and s if $w=x^2+y^2$, $x=r-s$, $y=r+s$.

26. Find $\lim_{(x,y)\to(0,0)}\frac{x^2-xy}{\sqrt{x}-\sqrt{y}}$.

Section - D

Answer any **2** questions out of 4 questions. Each question carries **6** marks. **(2×6=12)**

27. Find the absolute maximum and minimum value of $g(x)=8x-x^4$ on $[-2,1]$.

28. If $y=\sin ax+\cos ax$, show that $y_n=a^n\sqrt{\left(1+(-1)^n\sin 2ax\right)}$.

29. Find $\lim_{x\to\infty}\left(1+\frac{1}{x}\right)^x$.

30. Find the local extreme values of the function $f(x,y)=xy$.
