



K23U 4225

Reg. No. :

Name :

I Semester B.Sc. Degree (CBCSS – Supplementary/One Time Mercy
Chance) Examination, November 2023

(2014 to 2018 Admissions)

COMPLEMENTARY COURSE IN MATHEMATICS
1C01MAT-CS : Mathematics for Computer Science – I

Time : 3 Hours

Max. Marks : 40

SECTION – A

Answer **all** the questions. **Each** question carries **1** mark.

1. If $y = \frac{\log x}{x}$, find $\frac{d^2 y}{dx^2}$.

2. State the Rolle's theorem.

3. If $u = e^{x^3 + 2y}$, find $\frac{\partial^2 u}{\partial y \partial x}$.

4. Write the equations relating Cartesian and Spherical coordinates.

SECTION – B

Answer **any seven** questions. **Each** question carries **2** marks.

5. Find the derivative of $y = \sinh^{-1} x$.

6. If $y = \log \sin x$, show that $y_3 = \frac{2 \cos x}{\sin^3 x}$.

7. State Leibnitz's theorem.

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8. Verify Lagrange's mean value theorem for $f(x) = x^3$ in $[0, 3]$.
9. Write the general form of Taylor's series expansion of the function $f(x)$ about $x = a$.
10. Evaluate $\lim_{x \rightarrow 0} \frac{a^x - b^x}{x}$.
11. If $u = x^2(y - z) + y^2(z - x) + z^2(x - y)$, prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.
12. State the Euler's theorem of homogeneous functions.
13. Write the polar and pedal formulas of radius of curvature.

SECTION - C

Answer **any four** questions. **Each** question carries **3** marks.

14. If $y = x^{\tan x} + (\sin x)^{\cos x}$, find $\frac{dy}{dx}$.
15. If $\frac{x+b}{2} = a \tan^{-1}(a \log y)$, $a > 0$, prove that $yy'' - yy' \log y = (y')^2$.
16. Show that $x - \frac{x^2}{2} < \log(x+1) < x - \frac{x^2}{2(1+x)}$, for all $x > 0$.
17. If $v = At^{-1/2} e^{-x^2/4a^2t}$, prove that $\frac{\partial v}{\partial t} = a^2 \frac{\partial^2 v}{\partial x^2}$.
18. Prove that curvature of a circle is the reciprocal of its radius.
19. Graph the set of points whose polar coordinates satisfy $-\pi/4 \leq \theta \leq \pi/4$ and $-1 \leq r \leq 1$.



SECTION - D

Answer **any two** questions. **Each** question carries **5** marks.

20. Expand $\log(1 + e^x)$ by Maclaurin's series.

21. Evaluate :

a) $\lim_{x \rightarrow 0} (\cos x)^{1/x^2}$

b) $\lim_{x \rightarrow 0} (\cos x)^{\cot x}$

22. Find the evolute of the parabola $y^2 = 4ax$.

23. Find the rectangular coordinates of the centre of the sphere
 $\rho = 3\sin\phi(\cos\theta - 2\sin\theta)$.

