K21U 6562

Reg. No. : .....

Name : .....

I Semester B.Sc. Degree (C.B.C.S.S. – Supplementary) Examination, November 2021
(2015 – 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. Find $\frac{d}{dx}(\cosh x)$.
2. State the Cauchy's mean value theorem.
3. Find the domain of the function $f(x) = \log (x + y)$.
4. Write the Cartesian equation $x^2 + y^2 = 9$ by equivalent polar equation.

SECTION – B

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

5. Find $\frac{dy}{dx}$, when $x = 2\cos t - \cos 2t$ and $y = 2\sin t - \sin 2t$.
6. Find the n^{th} derivative of $y = \frac{x}{(x+2)(x+3)}$.
7. State the Maclaurin's theorem.
8. Verify Rolle's theorem for the function $f(x) = x^3 - 9x$ on $[0, 3]$.
9. Find the intervals for the function $f(x) = (x - 2)^2 (x + 1)$ is decreasing.
10. Evaluate $\lim_{x \to 1} \frac{1 + \log x - x}{1 - 2x + x^2}$.

P.T.O.

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

12. If $z = f(x, y)$, $x = \phi(u, v)$ and $y = \psi(u, v)$, find $\frac{\partial z}{\partial u}$ and $\frac{\partial z}{\partial v}$.

13. Show that for any curve $\frac{1}{\rho} = \frac{d}{dx}\left(\frac{dy}{ds}\right)$, where ρ is the radius of curvature of the curve.

SECTION – C

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

14. If $y = \sin(\sin x)$, show that $\frac{d^2y}{dx^2} + \tan x \frac{dy}{dx} + y \cos^2 x = 0$.

15. Expand $2x^3 + 7x^2 + x - 6$ in powers of $(x - 2)$.

16. Find the value of c of the Lagrange's mean value theorem for the function $f(x) = \log x$ on $[1, e]$.

17. If $u = \cot^{-1} \frac{x+y}{\sqrt{x}+\sqrt{y}}$, show that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + \frac{1}{4} \sin 2u = 0$.

18. If $r^m = a^m \cos m\theta$ is a curve, prove that $\rho = \frac{a^m}{(m+1)r^{m-1}}$.

19. Graph the set of points whose polar coordinates satisfy $-3 \le r \le 2$ and $\theta = \frac{\pi}{4}$.

SECTION – D

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

20. Expand cos x by Maclaurin's series.

21. Find the values of a and b such that $\lim_{x \to 0} \frac{x(1 + a\cos x) - b\sin x}{x^3} = 1$.

22. Prove that the coordinates of the centre of curvature at any point (x, y) can be expressed in the form $x - \frac{dy}{d\psi}$ and $y + \frac{dx}{d\psi}$.

23. Translate the equation $\rho = 9 \cos \phi$ into Cartesian and cylindrical equations.