K22U 3262

Reg. No. : .....

Name : .....

I Semester B.Sc. Degree (C.B.C.S.S. – Supplementary) Examination, November 2022
(2016-2018 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. $\cosh(x - y) =$ _____.
2. Give an example of a function f(x), which is continuous on [–1, 1] and not differentiable at x = 0.
3. Find the radius of curvature at any point on the curve $s = c \tan \Psi$.
4. Write the polar equation of circle with centre origin and radius 6.

SECTION – B

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

5. Find $\frac{d}{dx}(\coth x)$.
6. Find the n^{th} derivatives of $y = e^{mx}$.
7. State the Taylor's theorem.
8. State the Cauchy's mean value theorem.
9. If two functions have the same derivatives, show that they differ only by a constant.
10. Evaluate $\lim_{x \to 2} \frac{3x^2 - 12}{x - 2}$.

P.T.O.

11. Find the first order partial derivatives of $u = e^{ax} \sin by$.

12. Find $f_{xy}(0, 0)$ for the function $f(x, y) = e^{ax+by}$.

13. Define chord of curvature and write the equation of chord curvature parallel to x-axis and y-axis.

SECTION – C

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

14. If $I_n = \frac{d^n}{dx^n}\left(x^n \log x\right)$, prove that $I_n = nI_{n-1} + (n-1)$.

15. Find the Maclaurin's series expansion of sin x.

16. Evaluate $\lim_{x\to 0} \frac{\sin 2x + 2\sin^2 x - 2\sin x}{\cos x - \cos^2 x}$.

17. If $u = \log(x^2 + y^2 + z^2)$, prove that $x\frac{\partial^2 u}{\partial y \partial z} = y\frac{\partial^2 u}{\partial z \partial x} = z\frac{\partial^2 u}{\partial x \partial y}$.

18. For the cycloid $x = a(t + \sin t)$ and $y = a(1 - \cos t)$, prove that $\rho = 4a \cos(t/2)$.

19. Graph the set of points whose polar coordinates satisfy $0 \le \theta \le \pi$ and $r = -1$.

SECTION – D

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

20. If $y = \left[\log\left(\frac{x + \sqrt{x^2 - a^2}}{a}\right)\right]^2 + k\log\left(x + \sqrt{x^2 - a^2}\right)$, prove that

$$\left(x^2 - a^2\right)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 2a.$$

21. State the Rolle's theorem and discuss the applicability of Rolle's theorem to the function $f(x) = \begin{cases} x^2 + 1 & 0 \le x \le 1 \\ 3 - x & 1 < x \le 2 \end{cases}$.

22. Show that the evolute of the ellipse $x = a\cos\theta$, $y = b\sin\theta$ is $(ax)^{2/3} + (by)^{2/3} = (a^2 - b^2)^{2/3}$.

23. Find all the polar coordinates of the point $P\left(2, \frac{\pi}{2}\right)$.

———————