K18U 2188

Reg. No. : .....

Name : .....

I Semester B.Sc. Degree (CBCSS – Reg./Supple./Improv.) Examination, November 2018
Complementary Course in Mathematics
1C01 MAT-CS : MATHEMATICS FOR COMPUTER SCIENCE – I
(2014 Admn. Onwards)

Time : 3 Hours Max. Marks : 40

SECTION – A

All the first **4** questions are **compulsory.** They carry **1** mark **each.**

1. The derivative of $e^x \sinh^{-1} \sqrt{x}$ is

2. $\lim_{x \to 0} \frac{\log(1+x)}{x} =$

3. Compute $\frac{\partial f}{\partial x}$ at (1, 3) for $f(x, y) = 2x^3y^2 + 2y + 4x$.

4. Express the equation $x^2 + y^2 + 6y = 0$ in polar co-ordinates. **(1×4=4)**

SECTION – B

Answer **any 7** questions from among the questions **5** to **13.** These questions carry **2** marks **each.**

5. Find the n^{th} derivative of cosx.cos2x.cos3x.

6. If $xy = ae^x + be^{-x}$, prove that $xy_2 + 2y_1 - xy = 0$.

7. Expand sinhx as a Maclaurin's series.

8. State Cauchy's mean value theorem.

9. Is Lagrange's mean value theorem applicable to $f(x) = x^2 + 3x - 2$ on [1, 2] ?

10. Evaluate $\lim_{x \to 0} \left[\frac{1}{x} - \frac{1}{\sin x}\right]$.

P.T.O.

11. Find $\frac{\partial^2 y}{\partial x \partial y}$ if $u = x^2 \sin(y/x)$.

12. Find the radius of curvature at any point (x, y) on the curve $y = c \cosh(x/c)$.

13. If $5y^2 + \sin y = x^2$, find $\frac{dy}{dx}$. **(2×7=14)**

SECTION – C

Answer **any 4** questions from among the questions **14** to **19**. These questions carry **3** marks **each**.

14. Find the Taylor series for $\sin \pi x$ about $x = \frac{1}{2}$.

15. Find $\frac{dy}{dx}$ for $y = \frac{\sin x . \cos x . \tan^3 x}{\sqrt{x}}$ by using logarithmic differentiation.

16. Verify Rolle's theorem for $f(x) = e^x . \sin x$ on $[0, \pi]$.

17. If $u = f(y - z, z - x, x - y)$, then prove that $\frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial u}{\partial z} = 0$.

18. Find the equation of the circle of curvature at (1, 1) on the curve $x^3 + y^3 = 2$.

19. Find the rectangular co-ordinates of the point
$(r, \theta, z) = (4, \pi/3, -3)$ in cylindrical co-ordinates. **(3×4=12)**

SECTION – D

Answer **any 2** questions from among the questions **20** to **23**. These questions carry **5** marks **each**.

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

21. Evaluate $\lim_{x \to 0} (\cot x)^{\sin 2x}$.

22. Obtain the equation of the evolute of the curve $x = a(\cos\theta + \theta \sin\theta)$
$y = a(\sin\theta - \theta \cos\theta)$.

23. Find a spherical co-ordinate equation for the sphere $x^2 + y^2 + (z - 1)^2 = 1$.
(5×2=10)