



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

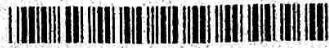
3. Compute $\frac{\partial f}{\partial x}$ at (1, 3) for $f(x, y) = 2x^3y^2 + 2y + 4x$.4. Express the equation $x^2 + y^2 + 6y = 0$ in polar co-ordinates. (1×4=4)

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 $\cos x \cdot \cos 2x \cdot \cos 3x$.6. If $xy = ae^x + be^{-x}$, prove that $xy_2 + 2y_1 - xy = 0$.7. Expand $\sinh x$ 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 $\lim_{x \rightarrow 0} \left[\frac{1}{x} - \frac{1}{\sin x} \right]$.



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 $\frac{dy}{dx}$. (2x7=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 $y = \frac{\sin x \cdot \cos x \cdot \tan^3 x}{\sqrt{x}}$ by using logarithmic differentiation.
16. Verify Rolle's theorem for $f(x) = e^x \cdot \sin x$ 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. (3x4=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 $(1 + x^2)y_{n+2} + (2n + 1)xy_{n+1} + n^2y_n = 0$.
21. Evaluate $\lim_{x \rightarrow 0} (\cot x)^{\sin 2x}$.
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 $x^2 + y^2 + (z - 1)^2 = 1$. (5x2=10)