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. $\lim\limits_{x \to 0} \dfrac{\log (1+x)}{x} =$

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

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 nth derivative of $\cos x.\cos 2x.\cos 3x$.

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 $\lim\limits_{x \to 0} \left[\dfrac{1}{x} - \dfrac{1}{\sin x} \right]$.

P.T.O.

11. Find $\dfrac{\partial^2 y}{\partial x \partial y}$ 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 $\dfrac{dy}{dx}$.

(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 $x = \dfrac{1}{2}$.

15. Find $\dfrac{dy}{dx}$ for $y = \dfrac{\sin x.\cos x.\tan^3 x}{\sqrt{x}}$ 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 $\dfrac{\partial u}{\partial x} + \dfrac{\partial u}{\partial y} + \dfrac{\partial u}{\partial z} = 0$.

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

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

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)