K20U 3188

Reg. No. : ....

Name : ....

I Semester B.Sc. Degree (CBCSS – Supplementary)
Examination, November 2020
(2014 – 2018 Admissions)
COMPLEMENTARY COURSE IN MATHEMATICS
1C01MAT-CS : Mathematics for Computer Science – I

Time : 3 Hours Max. Marks : 40

SECTION – A

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

1. The derivative of $ln(\tanh 2x) =$ ______________.

2. $\lim\limits_{x \to 0} \dfrac{x - \sin x}{e^x - 1} =$ ____________________.

3. Evaluate $\lim\limits_{(x, y) \to (-1, 2)} \dfrac{xy}{x^2 + y^2}$.

4. Find the polar co-ordinates of the point that has rectangular co-ordinates $(x, y) = \left(-2, -2\sqrt{3}\right)$.

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 $y = \cos^2 x \sin 2x$.

6. Using Logarithmic differentiation, find the derivative of $x\dfrac{\sqrt[3]{1 + x^2}}{\sin^2 x}$.

7. Expand cosx by Maclaurin's series.

8. State the Rolle's theorem.

9. Find out the point determined for $f(x) = \dfrac{1}{x^2}$ and $g(x) = \dfrac{1}{x}$ defined on [a, b] by the Cauchy's mean value theorem.

10. Evaluate $\lim\limits_{x \to 0} [\sin x \log x]$.

11. If $u = \sin^{-1}\left(\frac{x^2 + y^2}{x + y}\right)$, prove that $x\frac{\partial u}{\partial x} + y\frac{\partial u}{\partial y} + z\frac{\partial u}{\partial z} = \tan u$.

12. If $x^3 + y^3 = 3xy$, then find $\frac{dy}{dx}$.

13. Find the radius of curvature of the curve $xy = c^2$ at $(ct, c/t)$.

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 $ln\, x$ about $x = 1$.

15. If $x = \sin\theta$, $y = \cos \rho\theta$, prove that $(1 - x^2)y_2 - xy_1 + \rho^2 y = 0$.

16. Verify Lagrange's mean value theorem for $f(x) = lx^2 + mx + n$ for x over $[a, b]$.

17. *Find* $\frac{du}{dt}$ *if* $u = \sin(xy^2)$ *when* $x = \log t$, $y = e^t$.

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

19. Convert the point $(x, y, z) = (4, -4, 4\sqrt{6})$ in the rectangular co-ordinates to the point in the spherical co-ordinates.

SECTION – D

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

20. If $y = e^{\tan^{-1}x}$ then prove that $(1 + x^2)\, y_{n+2} + (2nx + 2x - 1)y_{n+1} + n(n + 1)\, y_n = 0$.

21. Evaluate $\lim\limits_{x \to 0}\left(\frac{\tan x}{x}\right)^{1/x^2}$.

22. Find the evolute of the parabola $y^2 = 4ax$.

23. Find the spherical co-ordinates equation for $x^2 + y^2 + (z - ½)^2 = ¼$.