



Reg. No. :

Name :



K19U 3187

I Semester B.Sc Degree (CBCSS- Supplementary/Improvement)

Examination, November-2019

(2014- 2018 Admission)

COMPLEMENTARY COURSE IN MATHEMATICS

1C01 MAT-ST : MATHEMATICS FOR STATISTICS-I

Time : 3 Hours

Max. Marks :40

SECTION -A

All the first **Four** questions are compulsory. They carry **1** marks each.
(4x1=4)

1. If $x = at^2$, $y = 2at$ find $\frac{dy}{dx}$. (1)
2. If the derivative of a function vanishes for all values of x in an interval, then the function must be a _____. (1)
3. Define limit of a function. (1)
4. To define polar co- ordinates we start with an origin called _____. (1)

SECTION -B

Answer any **Seven** questions from among the questions 5 to13. These questions carry **2** marks each. **(7x2=14)**

5. Find the derivative of $\operatorname{cosec} h^{-1}x$. (2)
6. Give two important properties of evolute. (2)
7. Replace the polar equation by equivalent Cartesian equations
 $r \cos \theta = -4$. (2)

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8. Find the spherical co-ordinates equation for the sphere $x^2 + y^2 + (z-1)^2 = 1$. (2)
9. Verify Rolle's theorem for x^2 in $[-1,1]$. (2)
10. show that $x^3 - 3x^2 + 2x + 2$ is monotonically increasing in every interval. (2)
11. Verify $\frac{\partial^3 u}{\partial y \partial x^2} = \frac{\partial^3 u}{\partial x^2 \partial y}$, where $u = x^2 y^2 + x^2 y^3$. (2)
12. Differentiate $(\sin x)^{\log x}$. (2)
13. If $x = a(\theta - \sin \theta)$, $y = a(1 - \cos \theta)$ find $\frac{d^2 y}{dx^2}$. (2)

SECTION - C

Answer any **Four** questions from among the questions 14 to 19. These questions carry 3 marks each. (4×3=12)

14. Find the n^{th} derivative of $\frac{x^2}{(x+2)(2x+3)}$. (3)
15. Separate the intervals in which the polynomial $2x^3 - 15x^2 + 36x + 1$ is increasing or decreasing. (3)
16. If z is a function of x and y prove that if $x = e^u + e^{-v}$, $y = e^{-v} - e^{-v}$, then $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \times \frac{\partial z}{\partial x} - y \times \frac{\partial z}{\partial y}$. (3)
17. Find the polar equation for the circle $x^2 + (y-3)^2 = 9$. (3)
18. Determine $\text{Lt}(\cos x)^{1/2}$ as $x \rightarrow 0$. (3)
19. graph the set of points whose polar co-ordinates satisfy the condition $r \leq 0$ and $\theta = \frac{\pi}{4}$. (3)



SECTION - D

Answer any **Two** questions from among the questions 20 to 23. These questions carry 5 marks each. (2×5=10)

20. If $y = (\sin^{-1} x)^2$ prove that $(1-x^2) \frac{d^2 y}{dx^2} - x \frac{dy}{dx} - 2 = 0$. (5)
21. Prove that if $y^3 - 3ax^2 + x^3 = 0$ then $\frac{d^2 y}{dx^2} + \frac{2 a^2 x^2}{y^5} = 0$. (5)
22. Translate the equation $\rho = 6 \cos \phi$. into Cartesian and cylindrical equation. (5)
23. Find $\text{Lt}_{x \rightarrow 0} \frac{1 + \sin x - \cos x + \log(1-x)}{x \tan^2 x}$. (5)