



Reg. No. : .....

Name : .....

**I Semester B.Sc. Degree (CBCSS – Supplementary)**  
**Examination, November 2020**  
**(2014 – 2018 Admissions)**  
**COMPLEMENTARY COURSE IN MATHEMATICS**  
**1C01MAT-PH : Mathematics for Physics and Electronics – I**

Time : 3 Hours

Max. Marks : 40

## SECTION – A

First 4 questions are compulsory. They carry 1 mark **each**.

1. Derivative of  $\cosh x$  is
2. What is the value of  $\lim_{x \rightarrow 0} \frac{\tan x}{x}$  ?
3. Define limit of a function of two variables.
4. Find  $\frac{dy}{dx}$  if  $x = 2t + 3$ ,  $y = t^2 - 1$ .

## SECTION – B

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

5. Verify mean value theorem for the function  $f(x) = x^2 + 2x + 9$  for interval (1, 5).
6. Find the  $n^{\text{th}}$  derivative of  $\log(ax + b)$ .
7. Using Maclaurin's theorem find the expansion of  $e^x$ .
8. Find limit  $\frac{\log(x - a)}{\log(e^x - e^a)}$  as  $x \rightarrow a$ .
9. Find the percentage error in the area of an ellipse when an error of one percent is made in measuring major and minor axes.



10. Find  $\lim (x \log x)$  as  $x$  tends to zero.
11. If  $y^2 - 3ax^2 + x^3 = 0$  then show that  $\frac{d^2y}{dx^2} + 2\frac{a^2x^2}{y^5} = 0$ .
12. Find the radius of curvature of the curve  $y = 3x^2 + 4x$  at  $(1, 7)$ .
13. Define evolute and involute of a curve.

## SECTION – C

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

14. Find the  $n^{\text{th}}$  derivative of  $\frac{x^2}{(x+2)(2x+3)}$ .
15. Differentiate  $e^{\sin^{-1}x}$  w. r. to  $\sin^{-1}x$ .
16. Find  $\lim_{x \rightarrow 0} \frac{\tan x - x}{x - \sin x}$ .
17. If  $z = f(x, y)$  prove that if  $x = e^u + e^{-v}$ ,  $y = e^{-u} - e^v$  then  $\frac{\partial z}{\partial u} - \frac{\partial z}{\partial v} = x \frac{\partial z}{\partial x} - y \frac{\partial z}{\partial y}$ .
18. Find the co-ordinates of centre of curvature of  $xy = c^2$  at  $(c, c)$ .
19. Find the spherical co-ordinates of the point that has rectangular co-ordinates  $(4, -4, 4\sqrt{6})$ .

## SECTION – D

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

20. State Leibnitz theorem on  $n^{\text{th}}$  derivative of product of two functions. Using it find  $n^{\text{th}}$  derivative of  $x^2 e^{3x}$ .
21. Find  $\lim_{x \rightarrow 0} \frac{e^x - e^{-x} - 2x}{x^2 \sin x}$ .
22. Find the radius of curvature of the curve  $\sqrt{x} + \sqrt{y} = 1$  at  $(\frac{1}{4}, \frac{1}{4})$ .
23. Find the equations of the paraboloid  $z = x^2 + y^2$  in cylindrical and spherical co-ordinates.