

Reg. No. : .....

Name : .....

**I Semester B.Sc. Degree (C.C.S.S. – Reg./Supple./Improv.)****Examination, November 2016****COMPLEMENTARY COURSE IN MATHEMATICS****1C01 MAT-CS : Mathematics for Computer Science – I****(2014 Admn. Onwards)**

Time : 3 Hours

Total Marks : 40

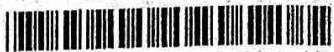
**SECTION – A**All the first 4 questions are **compulsory**. They carry 1 mark each.1. The derivative of  $\log \cosh x$  is

2.  $\lim_{x \rightarrow 0} \left( \frac{1}{x^2} - \cot^2 x \right) =$

3. Find the first order partial derivatives of  $\log(x^2 + y^2)$ .4. Graph the set of points whose polar co-ordinates satisfy  $\frac{2\pi}{3} \leq \theta \leq \frac{5\pi}{6}$ . **(4x1=4)****SECTION – B**

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

5. Find  $\frac{dy}{dx}$  if  $x = 3 \cos t - 2 \cos^3 t$  and  $y = 3 \sin t - 2 \sin^3 t$ .6. Derive the  $n^{\text{th}}$  derivative of  $y = \cos(ax + b)$ .7. Verify Rolle's theorem for  $f(x) = e^x(\sin x - \cos x)$  in  $\left[ \frac{\pi}{4}, \frac{5\pi}{4} \right]$ .



8. Show that  $f(x) = 2x^3 - 15x^2 + 36x + 1$  is strictly increasing in  $(-\infty, 2)$ .
9. Find the degree of the homogeneous function  $z = \frac{x^{\frac{1}{4}} + y^{\frac{1}{4}}}{x^{\frac{1}{6}} + y^{\frac{1}{6}}}$ .
10. If  $z(x+y) = x^2 + y^2$ , then show that  $\left(\frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right)^2 = 4\left(1 - \frac{\partial z}{\partial x} - \frac{\partial z}{\partial y}\right)$ .
11. Define radius of curvature and find it for  $s = 4a \sin\left(\frac{\psi}{3}\right)$ .
12. Find the chord of curvature through the pole (origin).
13. Obtain the polar equation of the circle  $x^2 + (y - 4)^2 = 16$ . (7×2=14)

### SECTION-C

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

14. If  $x^y \cdot y^x = 1$ , then find  $\frac{dy}{dx}$ .
15. Expand  $\log(1+x)$  by using Maclaurin's theorem.
16. Evaluate  $\lim_{x \rightarrow 0} \frac{xe^x - \log(x+1)}{\cosh x - \cos x}$ .
17. Determine  $\lim_{x \rightarrow 0} (\cos x)^{\frac{1}{x^2}}$ .
18. If  $H$  is a homogeneous function of  $x, y$  and  $z$  of degree  $n$ , then prove that  
 $x \frac{\partial H}{\partial x} + y \frac{\partial H}{\partial y} + z \frac{\partial H}{\partial z} = nH$ .
19. Prove that the curvature of a circle is a constant. (4×3=12)

### SECTION - D

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

20. If  $y = \frac{\sin^{-1}x}{\sqrt{1-x^2}}$ , then show that  $(1-x^2)y_{n+2} - (2n+3)xy_{n+1} - (n+1)^2 y_n = 0$ .

21. State Taylor's theorem. Use it to expand  $\tan^{-1}x$  in powers of  $\left(x - \frac{\pi}{4}\right)$ .

22. Show that  $f_{xy}(0, 0) \neq f_{yx}(0, 0)$  where  $f(x, y) = \begin{cases} 0 & \text{if } xy = 0 \\ x^2 \tan^{-1}\left(\frac{y}{x}\right) - y^2 \tan^{-1}\left(\frac{x}{y}\right), & \text{if } xy \neq 0 \end{cases}$

23. Find the evolute of the astroid  $x = a \cos^3\theta$  and  $y = a \sin^3\theta$ .

**(2x5=10)**