

**K15U 0588**

Reg. No. :

Name :

I Semester B.Sc. Degree (CCSS-Reg./Supple./Improv.)
Examination, November 2015
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 $e^{\sin h^2 x}$ is _____

2. $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right) = \underline{\hspace{2cm}}$

3. Find the first order partial derivatives of $\log(x^2 - y^2)$.

4. Graph the set of points whose polar coordinates satisfy $0 \leq r \leq 1$ and

$$\frac{\pi}{4} \leq \Theta \leq \frac{\pi}{2}.$$

(4×1=4)**SECTION – B**

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

5. Find $\frac{dy}{dx}$ when $x = 2\cos t - \cos 2t$ and $y = 2\sin t - \sin 2t$.

6. Derive the n^{th} derivative of $y = (ax + b)^m$ where m is a positive integer and a and b are non zero constants.

P.T.O.



7. Verify Rolle's theorem for $f(x) = \frac{\sin x}{e^x}$ in $[0, \pi]$.
8. Show that $f(x) = \sin hx$ is strictly increasing.
9. Find the degree of the homogeneous function $z = ax^2 + 2hxy + by^2$.
10. If $z = \log (y \sin x + x \sin y)$, then show that $\frac{\partial^2 z}{\partial x \partial y} = \frac{\partial^2 z}{\partial y \partial x}$.
11. Define radius of curvature and evaluate it for $s = 4a \sin \psi$.
12. Find the chord of curvature perpendicular to the radius vector.
13. Find the polar equation of the circle $x^2 + (y - 3)^2 = 9$. (7×2=14)

SECTION – C

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

14. Find $\frac{dy}{dx}$ if $y = x^{\sin x} + (\sin x)^x$.
15. Expand $\log \cos hx$ by using Maclaurin's theorem.
16. Determine $\lim_{x \rightarrow 0} \frac{\sin hx - x}{\sin x - x \cos x}$.
17. Evaluate $\lim_{x \rightarrow 0} (\cos x)^{\cot x}$.
18. If the sides and angles of a plane triangle ABC vary in such a way that its circum radius remains constant. Prove that $\frac{\delta a}{\cos A} + \frac{\delta b}{\cos B} + \frac{\delta c}{\cos C} = 0$ where δa , δb and δc denote small increments in the sides a , b , and c respectively.
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 $y = a \cos (\log x) + b \sin (\log x)$, then show that

$$x^2 y_{n+2} + (2n + 1) xy_{n+1} + (n^2 + 1) y_n = 0.$$

21. State Taylor's theorem. Use it to expand $\log \sin x$ in powers of $x - 2$.

22. Prove that $f_{xy}(0, 0) \neq f_{yx}(0, 0)$ for the function f is given by

$$f(x, y) = \begin{cases} \frac{xy(x^2 - y^2)}{x^2 + y^2}; & (x, y) \neq (0, 0) \\ 0 & \text{otherwise} \end{cases}$$

23. Obtain the evolute of the parabola $y^2 = 4ax$.

(2×5=10)
