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. $\lim_{x \to 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right) =$ ____________

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

4. Graph the set of points whose polar coordinates satisfy $0 \le r \le 1$ and $\frac{\pi}{4} \le \Theta \le \frac{\pi}{2}$. **(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 $\lim_{x \to 0} \frac{\sin hx - x}{\sin x - x \cos x}$.

17. Evaluate $\lim_{x \to 0} (\cos x)^{\cot x}$.

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 $\delta a, \delta b$ 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 sinx in powers of $x - 2$.

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

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

23. Obtain the evolute of the parabola $y^2 = 4ax$. **(2×5=10)**
