K16U 2503

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 coshx is

2. $\lim\limits_{x\to 0}\left(\frac{1}{x^2} - \cot^2 x\right) =$

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

4. Graph the set of points whose polar co-ordinates satisfy $\frac{2\pi}{3} \le \theta \le \frac{5\pi}{6}$. **(4×1=4)**

SECTION – B

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

5. Find $\frac{dy}{dx}$ if $x = 3\cos t - 2\cos^3 t$ and $y = 3\sin t - 2\sin^3 t$.

6. Derive the n^{th} derivative of $y = \cos(ax + b)$.

7. Verify Rolle's theorem for $f(x) = e^x(\sin x - \cos x)$ in $\left[\frac{\pi}{4}, \frac{5\pi}{4}\right]$.

P.T.O.

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 $z = \frac{x^{1/4} + y^{1/4}}{x^{1/5} + y^{1/5}}$.

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 $s = 4a\sin\left(\psi/3\right)$.

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 $x^y . y^x = 1$, then find $\frac{dy}{dx}$.

15. Expand $\log(1 + x)$ by using Maclaurin's theorem.

16. Evaluate $\lim\limits_{x\to 0} \frac{xe^x - \log(x+1)}{\cosh x - \cos x}$.

17. Determine $\lim\limits_{x\to 0} (\cos x)^{\frac{1}{x^2}}$.

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 $y = a\sin^3\theta$. **(2×5=10)**
