M 7902

Reg. No. : ....

Name : ....

I Semester B.Sc. Degree (CCSS – Regular) Examination, November 2014
(2014 Admn.)
COMPLEMENTARY COURSE IN MATHEMATICS
1C01 MAT – CS : Mathematics for Computer Science – 1

Time : 3 Hours Max. Marks : 40

SECTION – A

All the first **4** questions are **compulsory**. They carry **1** mark **each**.

1. The derivative of $\text{cosech}^{-1}x$ is __________

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

3. Find the first order partial derivatives of e^{x-y}.

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

SECTION – B

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

5. Find $\frac{dy}{dx}$ when $x = a(\cos t + \sin t)$ and $y = a(\sin t - t \cos t)$.

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

7. Verify Rolle's theorem for $f(x) = x^2$ in $[-1, 1]$.

8. Show that $f(x) = x^3 - 3x^2 + 3x + 2$ is strictly increasing in every interval.

P.T.O.

9. Find the degree of the homogeneous function tan u where $u = \tan^{-1}\left(\frac{x+y}{\sqrt{x}+\sqrt{y}}\right)$.

10. If $z = \tan^{-1}\left(\frac{y}{x}\right)$, then verify that $\frac{\partial^2 z}{\partial x^2} + \frac{\partial^2 z}{\partial y^2} = 0$.

11. Define the radius of curvature and evaluate it for $s = c \log \sec\psi$ where c is a constant.

12. Find the chord of curvature parallel to the y-axis.

13. Find the polar equation for the circle $(x-2)^2 + y^2 = 4$. **(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 $y = (\cos x) \log^x$.

15. Expand $e^{\sin x}$ by using Maclaurin's Theorem.

16. Determine $\lim\limits_{x \to 0} \frac{a^x - 1 - x\log_e^a}{x^2}$.

17. Evaluate $\lim\limits_{x \to a} (x-a)^{x-a}$.

18. In a triangle ABC, the angles and sides a and b are made to vary in such a way that the area remains constant. Show that a and b vary by small amounts δa, δb respectively, then $\cos A \delta a + \cos B \delta b = 0$.

19. To 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 $y = \cos(m\sin^{-1}x)$, then show that

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

21. State Taylor's theorem. Use it to expand $2x^3 + 7x^2 + x - 6$ in powers of $x - 2$.

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

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

23. Find the evolute of the astroid $x = a\cos^3\theta$ and $y = a\sin^3\theta$. **(2×5=10)**
