D 32494 (Pages : 3) Name.....

Reg. No.....

# FIRST SEMESTER B.Sc. DEGREE EXAMINATION, JANUARY 2013

(CCSS)

Mathematics (Complementary Course)

MA 1C 01—MATHEMATICS

Time : Three Hours Maximum : 30 Weightage

## Part A (Objective Type Questions)

*Answer all* **twelve** *questions.*

*Each bunch of four questions carries 1 weightage.*

1. Find $\underset{x\to -1}{\text{Lt}} \dfrac{x^3+4x^2-3}{x^2+5}$.

2. Find a point of discontinuity of the function $y=\dfrac{x+2}{\cos x}$.

3. Find $\dfrac{d\gamma}{d\theta}$ if $\gamma = 4 - Q^2 \sin\theta$.

4. The curve $y = x^2 - 2x + 1$ has a horizontal tangent at $x =$ _____.

(4 × ¼ = 1 weightage)

5. Define Rolle's theorem.

6. The formula for finding the sum of squares of first '$n$' natural numbers is _____.

7. Express $\lim\limits_{\|P\|\to 0} \sum\limits_{k=1}^{n}\left(3C_k^2 - 2C_k + 5\right) Dx_k$ as an integral if $p$ denotes a partition of the interval $[-1, 3]$.

8. Evaluate $\int\limits_{-4}^{-1} \dfrac{\pi}{2}\, d\theta$.

(4 × ¼ = 1 weightage)

9. Suppose $\int\limits_{1}^{9} f(x)\,dx = -1$ and $\int\limits_{7}^{9} f(x)\,dx = 5$ then $\int\limits_{1}^{7} f(x)\,dx =$ _____.

10. If $f$ is integrable on $[a, b]$ then the average value of $f$ on $[a, b]$ is av $(f)$ = _____.

11. Where does the function $y = \sec x$ have vertical asymptotes ?

12. Use L' Hopital's rule find $\underset{t\to 0}{\text{Lt}} \dfrac{\sin t^2}{t}$.

(4 × ¼ = 1 weightage)

Turn over

## Part B (Short Answer Type Questions)

*Answer all* **nine** *questions.*
*Each question carries 1 weightage.*

13. Find $\lim_{x \to 1} \frac{x-1}{\sqrt{x+3}-2}$.

14. If $1-\frac{x^2}{4} \le u(x) \le 1+\frac{x^2}{4}$ for all $x \neq 0$ then find $\lim_{x \to 0} u(x)$.

15. Suppose $\lim_{x \to 0} f(x) = 1$ and $\lim_{x \to 0} g(x) = -5$ find $\lim_{x \to 0} \frac{2f(x)-g(x)}{[f(x)+7]^{2/3}}$.

16. Find the slope and equation of the tangent at the point $(3, 3)$ to the curve $g(x) = \frac{}{x}$

17. Find the function $f(x)$ whose derivative is sin $x$-and whose graph passes th point $(0, 2)$.

18. Find the linearization of $f(x) = \sqrt{1+x}$ at $x = 3$.

19. Find the area between the curve $y = \frac{x}{2} + 1$ and the $x$-axis on the interval $[0, b]$.

20. Evaluate $\frac{d}{d0} \int_0^{\tan\theta} \sec^2 y \, dy$.

21. Find the length of the curve $x = \frac{y^3}{3} + \frac{1}{4y}$ from $y = 1$ to $y = 3$.

(9 × 1 = 9

## Part C (Short Essay Questions)

*Answer any* **five** *questions.*
*Each question carries 2 weightage.*

22. Find the first and second derivatives of the function $w = \left(\frac{1+3z}{3z}\right)(3-z)$.

23. If $f(x) = x + 1$, L = 5, $x_0 = 4$, $\epsilon = \cdot 01$, find an open interval containing $x_0$ and a value such that $0 < |x - x_0| < \delta$ implies $|f(x) - L| < \epsilon$.

24. The curve $y = ax^2 + bx + c$ passes through the point $(1, 2)$ and the line $y = x$ is a tangent to the curve at the origin. Find $a$, $b$, $c$.

25. Find the asymptotes of the curve $y = \dfrac{x+3}{x+2}$.

26. Find the area of the region enclosed by the parabola $y = 2 - x^2$ and the line $y = -x$.

27. Use max–min inequality find upper and lower bounds for the value of $\int_0^1 \dfrac{1}{1+x^2}\,dx$.

28. For what values of $a$, $m$ and $b$ does the function $f(x) = \begin{cases} 3 & , x = 0 \\ -x^2 + 3x + a & , 0 < x < 1 \\ mx + b & , 1 \le x \le 2 \end{cases}$

Satisfy the hypotheses of the mean value theorem on the interval $[0, 2]$.

(5 × 2 = 10 weightage)

## Part D (Essay Questions)

*Answer any* **two** *questions.*
*Each question carries* 4 *weightage.*

29. Find $y'$ and $y''$ and graph the function $y = x^4 - 4x^3 + 10$. Include the co-ordinates of any local extreme points and inflection points.

30. Find the area of the surface generated by revolving the curve $y = 2\sqrt{x}$, $1 \le x \le 2$ about the $x$-axis.

31. Find the volume of the solid generated by revolving the region between the curve $y = \sqrt{x}$ and the lines $y = 1$, $x = 4$ about the line $y = 1$.

(2 × 4 = 8 weightage)