**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 $\int_{-4}^{-1} \dfrac{\pi}{2} \, d\theta$.

(4 × ¼ = 1 weightage)

9. Suppose $\int_1^9 f(x)\,dx = -1$ and $\int_7^9 f(x)\,dx = 5$ then $\int_1^7 f(x)\,dx =$ ———————.

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 $x \ne 0$ then find $\underset{x\to 0}{\text{Lt}}\, u(x)$.

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 $g(x)=\frac{x}{x-2}$.

17. Find the function $f(x)$ whose derivative is $\sin x$ and whose graph passes through the 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 $\frac{d}{d\theta}\int_0^{\tan\theta} \sec^2 y\, dy$.

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

(9 × 1 = 9 weightage)

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

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 $y = \frac{x+3}{x+2}$.

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 $\int_0^1 \frac{1}{1+x^2}\,dx$.

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)