

Name.....

Reg. No.....

**FIRST SEMESTER B.Sc DEGREE (SUPPLEMENTARY/IMPROVEMENT)
EXAMINATION, NOVEMBER 2014**

(U.G.-CCSS)

Complementary Course—Mathematics

MM 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 $\text{Lt}_{x \rightarrow -2} \sqrt{4x^2 - 3}$.

2. The functions $f(x) = \frac{\cos x}{x}$ is not continuous at $x = \underline{\hspace{2cm}}$.

3. Find $\left. \frac{dr}{d\theta} \right|_{\theta=0}$ if $r = \frac{2}{\sqrt{4-\theta}}$.

4. The formula for finding the sum of the cubes of first n natural numbers is $\underline{\hspace{2cm}}$.

(4 × ¼ = 1 weightage)

5. State mean value theorem.

6. Express $\lim_{|p| \rightarrow 0} \sum_{k=1}^n \sec(c_k) \Delta x_k$ as an integral if p denotes a partition of the interval $\left[\frac{-\pi}{4}, 0 \right]$.

7. Evaluate $\int_{\sqrt{2}}^{\sqrt{18}} \sqrt{2} dr$.

8. If $\int_1^2 f(x) dx = 5$ then $\int_2^1 f(t) dt = \underline{\hspace{2cm}}$.

(4 × ¼ = 1 weightage)

9. Find the average value of $f(t) = \sin t$ on $[0, 2\pi]$.10. The critical points of $f(x) = x^3 - 12x + 4$ are $\underline{\hspace{2cm}}$.11. If $f'(x) = 2x$ for all x and $f(1) = 0$ then $f(x) = \underline{\hspace{2cm}}$.12. Use L' Hopital's rule find $\text{Lt}_{t \rightarrow 0} \frac{\sin 5t}{t}$.

(4 × ¼ = 1 weightage)

Turn

Part B (Short Answer Type Questions)

Answer all nine questions.

Each question carries 1 weightage.

13. If $\sqrt{5-2x^2} \leq f(x) \leq \sqrt{5-x^2}$ for $-1 \leq x \leq 1$, find $\lim_{x \rightarrow 0} f(x)$.
14. Suppose $\lim_{x \rightarrow 2} p(x) = 4$, $\lim_{x \rightarrow 2} r(x) = 0$ and $\lim_{x \rightarrow 2} s(x) = -3$. Find $\lim_{x \rightarrow 2} \left[-4p(x) + \frac{5r(x)}{s(x)} \right]$.
15. Find the slope and equation of the tangent at the point $(4, 2)$ to the curve $f(x) = \sqrt{x}$.
16. Find the 1st and second derivatives of the function $s = \frac{t^2 + 5t + 1}{t^2}$.
17. Find the linearization of $f(x) = x^3 - x$ at $x = 1$.
18. Evaluate $\frac{d}{dx} \int_1^{\sin x} 3t^2 dt$.
19. Find the length of the curve $x = \frac{y^3}{3} + \frac{1}{4y}$ from $y = 1$ to $y = 3$.
20. Find the area of the surface generated by revolving the curve $y = 2\sqrt{x}$, $1 \leq x \leq 2$ about the x -axis.
21. Find the points at which the curve $y = x^4 - 2x^2 + 2$ has horizontal tangents.

(9 × 1 = 9 weightage)

Part C (Short Essay Questions)

Answer any five questions.

Each question carries 2 weightage.

22. If $f(x) = \sqrt{19-x}$, $L = 3$, $x_0 = 10$, $\epsilon = 1$, find an open interval containing x_0 and a value of $\delta > 0$ such that $0 < |x - x_0| < \delta$ implies $|f(x) - L| < \epsilon$.
23. The curves $y = x^2 + ax + b$ and $y = cx - x^2$ have a common tangent line at the point $(1, 0)$. Find a , b and c .
24. Using Sandwich theorem find the asymptotes of the curve $y = 2 + \frac{\sin x}{x}$.
25. Find the area of the region between the x -axis and the curve $f(x) = x^3 - x^2 - 2x$; $-1 \leq x \leq 2$.
26. Use max-min inequality find upper and lower bounds for the value of $\int_0^1 \frac{1}{1+x^2} dx$.

17. Find the volume of the solid generated by revolving the region bounded by $y = \sqrt{x}$ and the lines $y = 1$, $x = 4$ about the line $y = 1$.
18. Find the absolute maximum and minimum values of $f(x) = x^{3/4}$ in $[-1, 8]$.

Part D (Essay Questions)

(5 × 2 = 10 weightage)

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

Graph the function : $f(x) = \begin{cases} 1, & x \leq -1 \\ -x, & -1 < x < 0 \\ 1, & x = 0 \\ -x, & 0 < x < 1 \\ 1, & x \geq 1 \end{cases}$

Then write the one sided limits, limits, one-sided continuity and continuity of f at each of the points $x = -1, 0$ and 1 . Are any of the discontinuities removable? Explain.

19. Find y' and y'' and graph the function $y = x^4 - 5x^3$. Include the coordinates of any local extreme points and inflection points.

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

(2 × 4 = 8 weightage)