THIRD SEMESTER B.Sc. DEGREE EXAMINATION, NOVEMBER 2010

(CCSS)

Mathematics—Core Course

MM 3B 03—CALCULUS

Time : Three Hours   Maximum Weightage : 30

I. Objective Type questions
(Answer all questions, weightage 12 X ¼ = 3)

1. The average rate of change of the function $f(x) = x^3 + 1$ over the interval [2, 3] is ...

2. If $2 - x^2 5 g(x) 5 2 \cos x$ for all x, then $\lim_{x \to u} g(x) =$

3. Suppose $f'(x) = 2x$ for all x, and if f (0) = 0 then f (2) =

4. The critical points of f if $f'(x) = x (x \; \mathbf{1})$

5. The linearization of $f(x) = x^4$ at x = 1 is ...

6.   2x+3
             $5x+7$

7. A function with continuous first derivative is said to be ---

8. A differentiable function is always ...

9. $\frac{d}{dx} \int_1^{sinx} 3t_2 \, dt =$

10. The volume of a solid of known integrable cross-section area $A(x)$ from x = a to x = b is ...

11. The turning effect of a force about the origin is called ...

12. When a body moves a distance d along a straight line as a result of being acted on by a force of constant magnitude F in the direction of the motion, the work done by the force on the body is ...

II. Short answer type questions:
Answer all question (9X1 = 9 weightage)

13. Find   x-5
                    25

14. If $f(x) = x + 1$, find an open interval about 4 on which $|f(x) \quad 5| < 0.01$.

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

16. Find the interval on which the function $g(t) = -t^- - 3t + 3$ is increasing

Turn over

17. **What is the smallest perimeter possible for a rectangle whose area is 16 cm$^-$?**

18. **State the Mean Value Theorem for Definite Integrals**

19. **Evaluate** $\int_0^- \sqrt{y+1}\, dy$

20. **Find the centre of mass of a wire of constant density 6 shaped like a semicircle of radius 'a'**

21. **Find the work done by a variable force F(x) = 1/x^2 N along the x axis from x =1 m to x = 10 m.**

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Short Essay or Paragraph Questions
Answer any 5 questions from 7 (5X2 = 10 weightage)

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22. **Show that** $\quad \dfrac{-}{x} = 0$

23. **Using *Sandwich Theorem* find the asymptotes of the curve**

    $Y = 2 +$

24. **Show that the value of** $\int_0^- \sqrt{1 + \cos x}\ dx$ **cannot possibly be 2.**

25. **Find the area of the region in the first quadrant that is bounded above by y = $\sqrt{x}$ and below by the x = axis and the line y = x**

26. **Find the volume of the solid of revolution of the solid generated by revolving the region between they-axis and the curve x = 2/y. 1 < y < 4**

27. **Find the length of the plane curve y = (x/2)^{213} from x = 0 to x =**

28. **Show that the centre of mass of a straight, thin strip or rod of constant density lies half way between its two ends.**

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IV. Essay Questions:
Answer any 2 questions (2X4 = 8 weightage)

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29. **Consider the function f defined by**

    - $x^2 - 1;\ -1 \quad x < 0$
    - $2x;\ \mathbf{O} < x < 1$

    $f(x) = \underline{\quad 1;\qquad\qquad x = 1\quad}$

    - $-2x + 4;\ 1 < x < 2$
    - $0;\qquad 2 < x < 3$

    a) **Find f(-1)**

    b) **Does** $\lim_{x \to -1+} f(x)$ **exist**

c) Does $f(x) = f(-1)$

d) Is f continuous at x = -1

30. Define absolute extrema values of a function

Find the absolute extrema values of $g(t) = 8t^2 - t^4$ on [-2, 1]

31. The region bounded by the curve $y = x^2 + 1$ and the line $y = -x + 3$ is revolved about the x-axis to generate a solid. Find the volume of the solid.